THE
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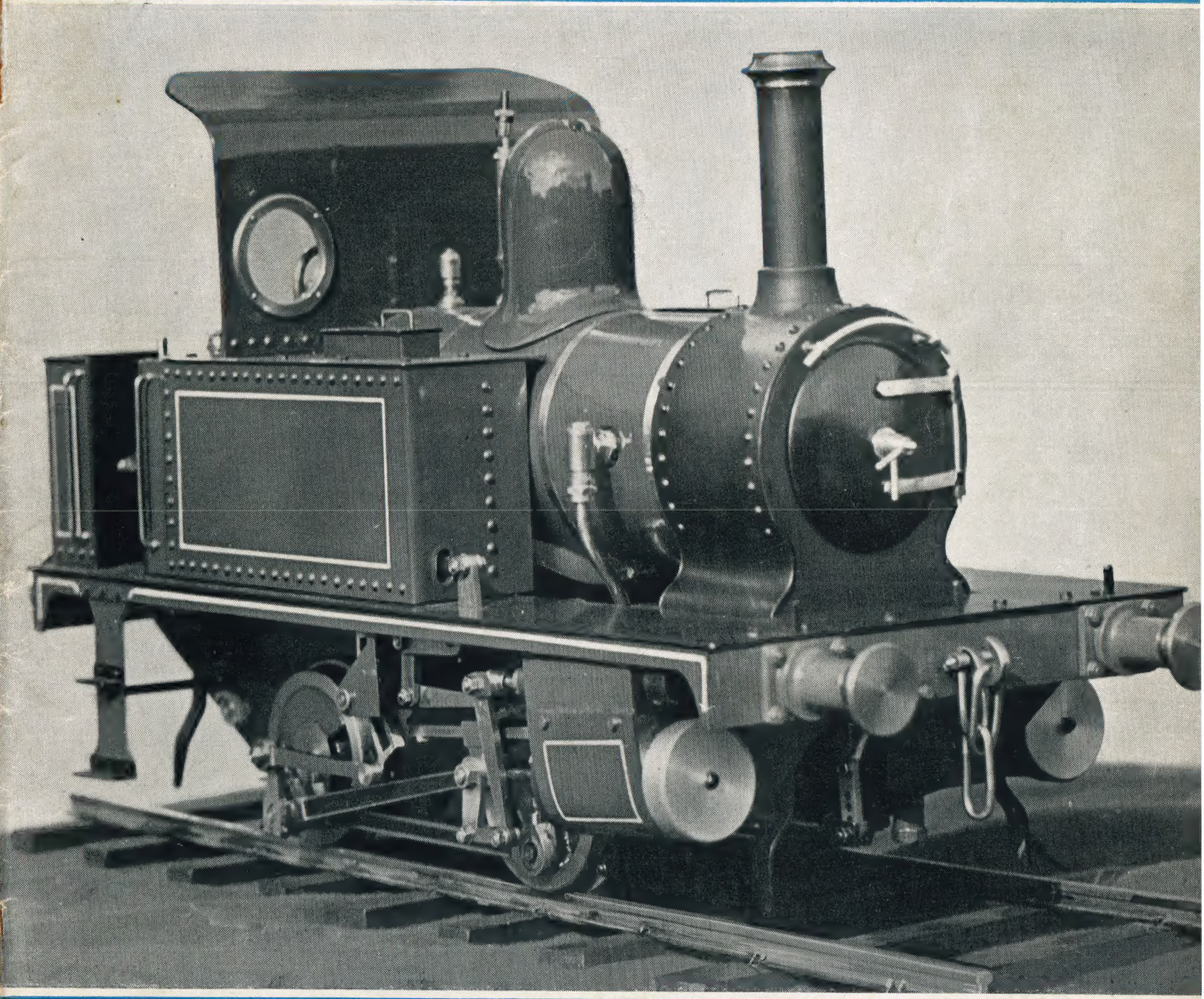

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- HOME-MADE MINNOWS FOR ANGLING
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MAKING A DIVIDING ATTACHMENT FOR THE G.A. LATHE

DECEMBER 2nd 1954
Vol. 111 No. 2793

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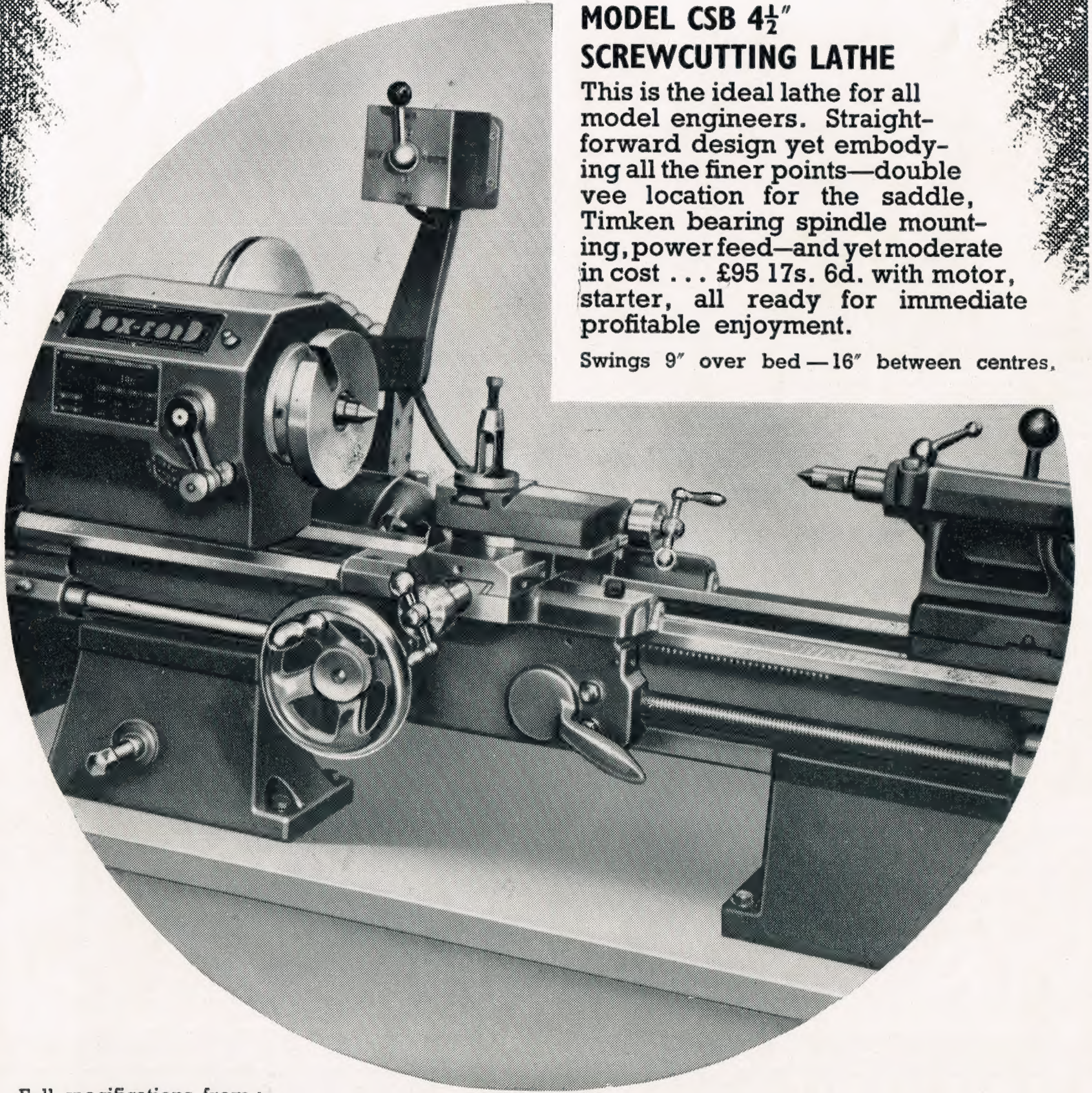

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THE
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EVERY THURSDAY
Volume 111 - No. 2793
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SMOKE RINGS

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OUR COVER PICTURE

This week's photograph shows a very nice example of *Tich* made by Mr. A. E. Lowe, of Nottingham, who had never made a model before; he describes its construction, together with further illustrations, on another page in this issue. The story shows what can be done by an enthusiast who has the courage of his convictions and the will to abide by instructions. As Mr. Lowe states, the success of this has encouraged him to begin building a *Maisie*, a much more intricate job; but we feel that he will make just as good an engine of it as he has done of his *Tich*. Good luck to him !

Modern Transport

A RECENTLY issued transport information bulletin announced: "A helicopter service will be opened between Waterloo and London Airport. The fare is 30s. and the trip takes 18 months."

The trip is certainly cheap at the price, in view of the time taken for a distance of approximately 11 miles; but we cannot help wondering if the helicopter can be as efficient as it is claimed to be, as a means of transport. We know of a train-load of about 900 tons of Welsh coal that was hustled over the 140 miles from Newport to London in only 11 days. But passenger trains take much less time, of course. Obviously, it is quicker by rail; and we believe it is cheaper per mile !

A New Australian Society

A NEW society, the Morwell Society of Model Engineers, has recently been formed in Morwell, Victoria, Australia; its first general meeting was held on September 29th, and was a great success. Locomotives are the main interest, with emphasis on "OO" gauge; but two members are busy building L.B.S.C.'s *Doris*, the 3½-in. gauge L.M.S. "Class 5" 4-6-0 engine.

The president of the society is Mr. R. S. Philips, who is a very keen model railway enthusiast and worker in "OO" gauge. He has given a talk from which the members learnt much about coach construction. Plans for future meetings are well in hand, and we wish the society every success.

The Hon. Secretary is Mr. J. W. BOWEN, 30, Hunt Street, Morwell, Victoria, Australia.

Our Old Handbooks

THE NOTE published recently, under the heading "An Interesting Find" brought in many letters from older readers who still possess copies of the old "M.E." series of handbooks. In fact, some of our correspondents were kind enough to send copies for our inspection. It is now quite clear that "Machinery for Model Steamers" was first published in January, 1903; also, by that date, Nos. 1 and 3 of the series had reached a 6th edition each, and No. 5 was in its 5th edition.

In our office files of THE MODEL ENGINEER, the earliest advertisement of these little books, as a series, appears in the issue for March 15th, 1901, when Nos. 1 to 4 were announced, although "Model Boiler Making," by E. L. Pearce, which became No. 6 of the series, was being advertised separately a month earlier. All of them were price 6d., or, by post, 7d.

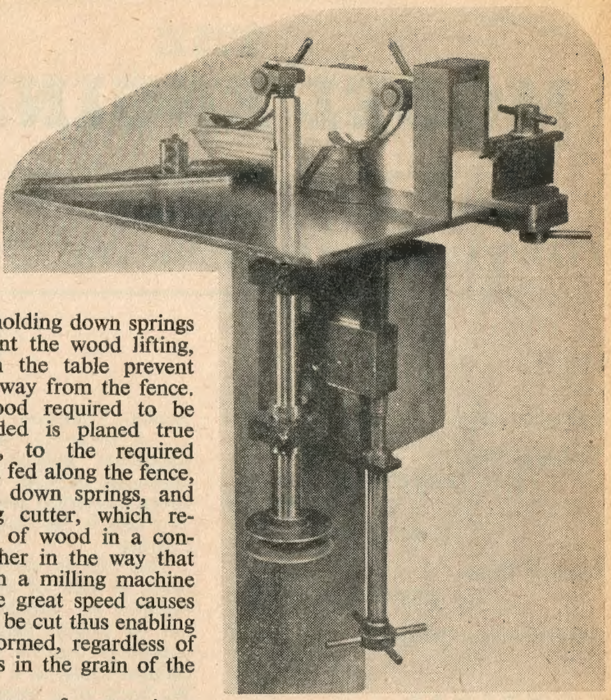
Some readers may think it strange that we cannot be more definite on this interesting matter; but the reasons are: first, the oldest member of our present staff was little more than an infant when these books were first published; secondly, many of our records were destroyed during the war, and, thirdly, only a few of our early bound volumes of THE MODEL ENGINEER contain advertisements.

Fred Smith, B.E.M.

IT IS with deep regret that we have to report the death, at the age of 69, of Fred Smith, B.E.M., of Pinxton, which occurred at the Nottingham General Hospital on November 13th. Mr. Smith was well known in the Midlands as a thoroughly expert model engineer whose work was always interesting and somewhat out of the ordinary. He was a founder member of the Nottingham Society of Model Engineers, a frequent exhibitor at model engineering exhibitions in the provinces as well as in London, and he has often contributed to THE MODEL ENGINEER, of which he had been a reader for about fifty years. He was ever ready to help and encourage newcomers to the hobby, and his advice, drawn from profound knowledge and long experience, was constantly being sought and always willingly given. His chief interest was in stationary engines, more especially of the older types, and he had an extensive collection of such models, most of which were his own work, though a few had been acquired and restored by him. Our hobby has lost another old and true friend whose influence, however, will be felt for many years to come.

A Miniature Moulding Spindle

By Norman A. Ough



General view of the machine, showing the elevating screw

THIS machine has been constructed for cutting mouldings or grooves in wood. It is a kind of vertical milling machine, carrying varieties of fly-cutters on a spindle which passes through the centre of a horizontal work table, and which revolves at high speed—four or five thousand revolutions a minute. The spindle can be raised or lowered in relation to the surface of the table. At its upper end is a vertical slot, passing right through, into which the cutters are inserted, and held in position by a locking-bolt in the axis of the spindle.

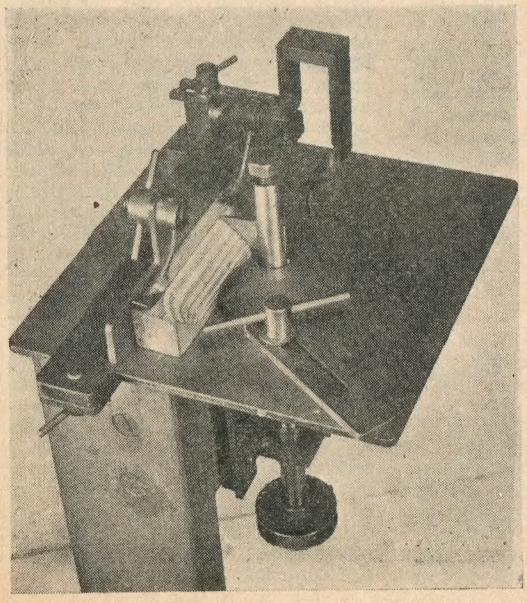
The Cutters

These are made from flat tool-steel of $\frac{1}{8}$ in. × $\frac{1}{2}$ in. section, and, when filed to any required shape, are hardened and tempered. A cutter is placed in the spindle so that its shaped edge which is to generate a moulding, projects, the blank end being left flush with the other side. An adjustable "fence" made from steel angle bar is placed on the table, and made fast in any position by a locking device. The position of the fence in relation to the spindle is governed by the size of the wood lengths required to be moulded, its function being to guide the wood past the cutter.

Two adjustable holding down springs in the fence prevent the wood lifting, and two more on the table prevent it from vibrating away from the fence. The length of wood required to be grooved or moulded is planed true and parallel-sided, to the required section, and is then fed along the fence, under the holding down springs, and past the revolving cutter, which removes small chips of wood in a continuous stream rather in the way that a fast fly cutter on a milling machine removes brass. The great speed causes very small chips to be cut thus enabling mouldings to be formed, regardless of "shakes" or knots in the grain of the wood.

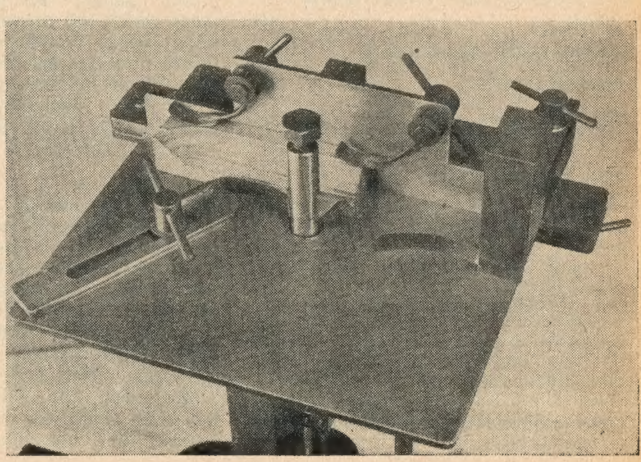
The simplest form of cutter is a single square-ended blade which will cut a square groove along the face of a length of wood. Since the spindle can be adjusted in a vertical direction, the groove may be cut at any position on the face of the wood. If a second square blade were formed on the cutter, separated by a non-cutting portion, a double groove would result. Reduced to the necessary smallness, the two grooves in the sides of double blocks for ship models can be formed on a length of boxwood, which, turned at right-angles, can receive a single score (for the rope strop) made by a blade with a rounded end. The blocks can then be shaped and cut off one by one. The method ensures uniformity in size, saves time in scoring and grooving.

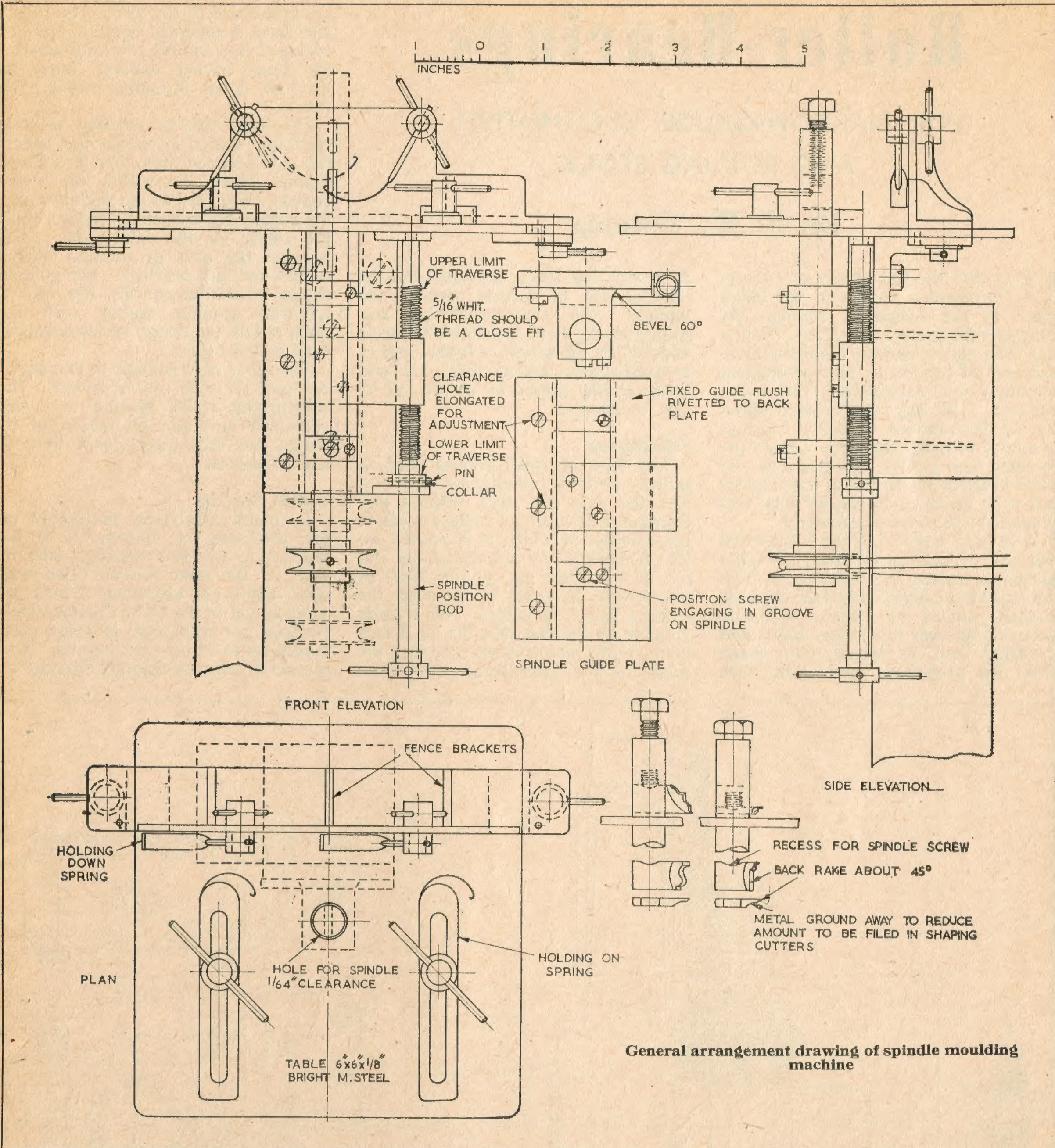
A cutter having three or four steps formed on it will generate flights of steps for architectural models. A few years ago, I received a contract from the Imperial War Museum to build a



Left: Piece of wood being moulded. The curved end of the cut shows the radius of the path of the cutter

Below: General view of table and fence. A second spring on the table, as shown in the drawing, would be better than the one on the right attached to the fence





General arrangement drawing of spindle moulding machine

model of the cruiser *Dorsetshire*, together with a model of No. 14 dock at Portsmouth Yard, in which she was represented in the final stages of a refit and re-armament. The scale was 1 in. = 16 ft. and all the " altars " and steps of the dock were made on the machine illustrated here. This would have been a lengthy process without it.

Variations of the step type of cutter, made by filing the square parts into curves, produce all the classical and most of the Gothic mouldings and, depending on the size and power of the machine, of any scale.

Varied Uses

The reader will see that the spindle can have very varied usefulness in general modelmaking. In a film studio, it is indispensable, as the construction of sets involves the use of great quantities of mouldings of all kinds. It is rather a dangerous tool to use as the high speed of the spindle makes the cutters quite invisible. On a full-size machine, the latter may be blades three inches deep and projecting four or more inches. There was an occasion at Ealing Studios when the spanner used to tighten the securing bolt for the cutters was left on, and the machine started. Fortunately it was noticed and a man yelled to everybody to lie on the floor, whereupon he crawled up to the switch and stopped the motor. If that spanner had come off it would have gone through a wall ! For this reason,

(*Continued on page* 646)

Roller-Bearings

FOR NARROW-GAUGE LOCOMOTIVES AND ROLLING STOCK

By E. W. Twining

DURING the last twenty or twenty-five years a revolution has taken place in the design of bearings for railway rolling stock, whereby friction has been almost entirely eliminated and the cost of lubricants, and consequent attention and maintenance, very much reduced. This has been brought about by the introduction of roller bearings arranged in much the same way as the familiar, and earlier, ball-bearing. By these bearings the length of the journals has been made much shorter than was previously considered necessary.

A railway wheel bearing is subjected not only to loads in the nature of static journal pressures, but to others as well. Amongst these may be cited the dynamic stresses caused by shocks occurring when riding over rail joints, points and crossings and in locomotives, loads from the propelling mechanism, such as alternating steam pressures and the reciprocation of moving parts of the motion. On both locomotives and rolling stock, there are additional loads imposed by the action of brakes and to a considerable extent there are end thrust shocks caused by curves and by side oscillation.

Self-aligning

The type of roller-bearing used in railway works is self-aligning, that is to say, the axle can turn, without any increase in friction, at a slight angle to the axlebox in which it is housed, so that if there is any differential rise and fall of axleboxes on opposite sides of the vehicle no stress is put upon the axlebox flanges or guides. This is made possible by the fact that the inner face of the outer race is made spherical, the centre of the sphere being struck from the centre-line of the axle. The rollers also have a spherical contour and are arranged in a double row with separating rings having spacing arms to maintain equal distances between the rollers.

The inner ring or raceway has two concaved tracks in which the rollers run, and between these there is a flange against which the rollers can make contact. The ends of the slightly tapering rollers are shaped as spheres with the centre of the intersecting point between the axes of rotation of the rollers and the bearing. The guiding flange of the inner ring has also a spherical guiding surface with the same radius and centre as the spherical ends of the rollers.

The roller cage is made in two parts: one part for each row of rollers. The self-aligning roller bearing is a self contained unit and by reason of its design can take thrust loads in both end directions.

Double Bearings

In many axleboxes, noticeably on the continent of Europe, it is the practice to use two bearings, side by side, on the same journal often with static loads not exceeding 8 tons per axlebox, yet in the United States, single bearings are employed, in some cases loaded up to 19 tons per journal. Now the use of two self-aligning bearings on

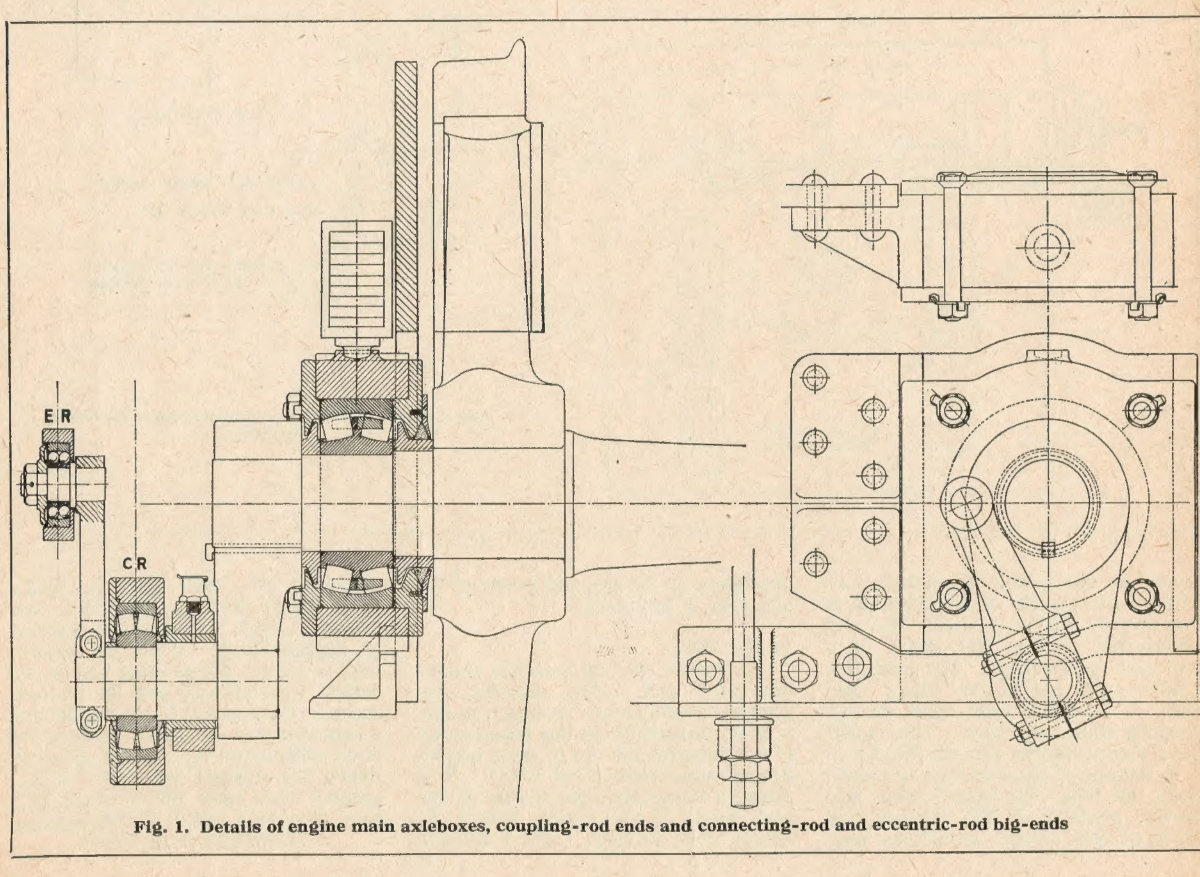


Fig. 1. Details of engine main axleboxes, coupling-rod ends and connecting-rod and eccentric-rod big-ends

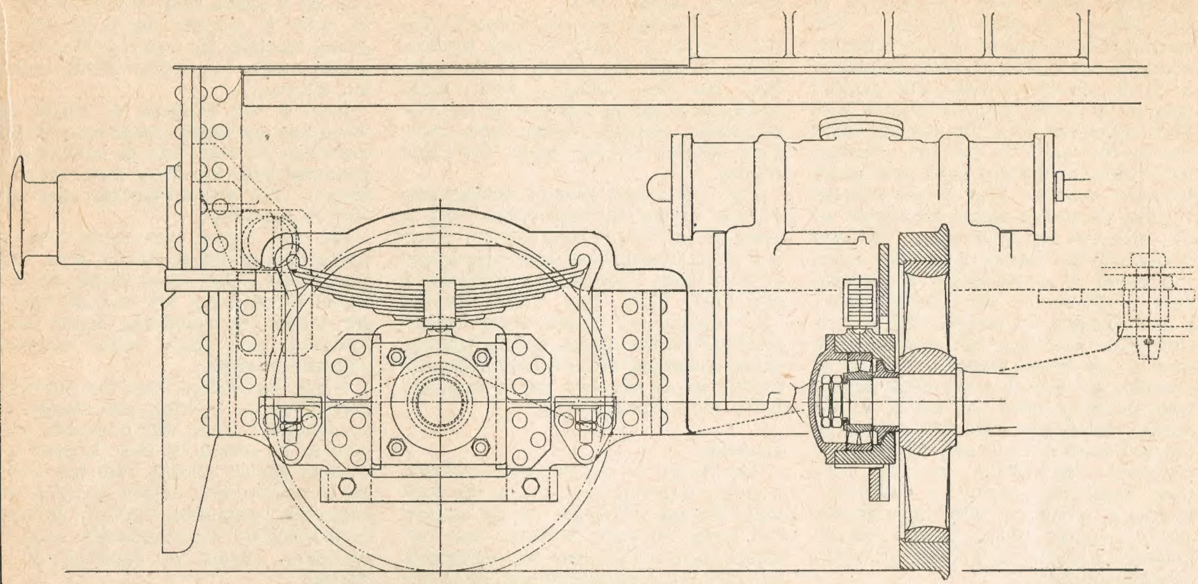


Fig. 2. Details of the axleboxes of the engine radial trucks

the same journal destroys the self-aligning properties and imposes additional stresses such as the original long plain bearing had to withstand; obviously the bearing has no longer the flexibility which it ought to have and to compensate for this the axlebox must be fitted quite freely in its guides, so that it may rise and fall without imposing bending stresses on the journal nor additional loads upon one or the other of the rows of rollers. With perfectly free self-alignment yielded by a single bearing there is no bending moment on the journal, it is in shear only and, therefore, can be shorter and of smaller diameter.

Every railway engineer knows that when an axlebox runs hot heavy expenses are incurred, not only for repairing the damaged box, but by reason of the dislocation of traffic. Roller bearings never run hot and, therefore, costs of this kind have never to be incurred; furthermore roller-bearing axleboxes impose neither service nor load restrictions and, therefore, permit of a better utilisation of the rolling stock.

Train Resistance

Turning our attention to train resistance the greatest at high speed is that of air-drag. The difference between plain and roller bearings at speed does not appear to be very great, but the difference at low speeds, and particularly at starting is remarkable. The makers of the SKF bearings say, in one of their brochures, that it has been found possible to obtain a reduction in starting resistance amounting to as much as 85 per cent., and it has been found, with roller-bearings, that the

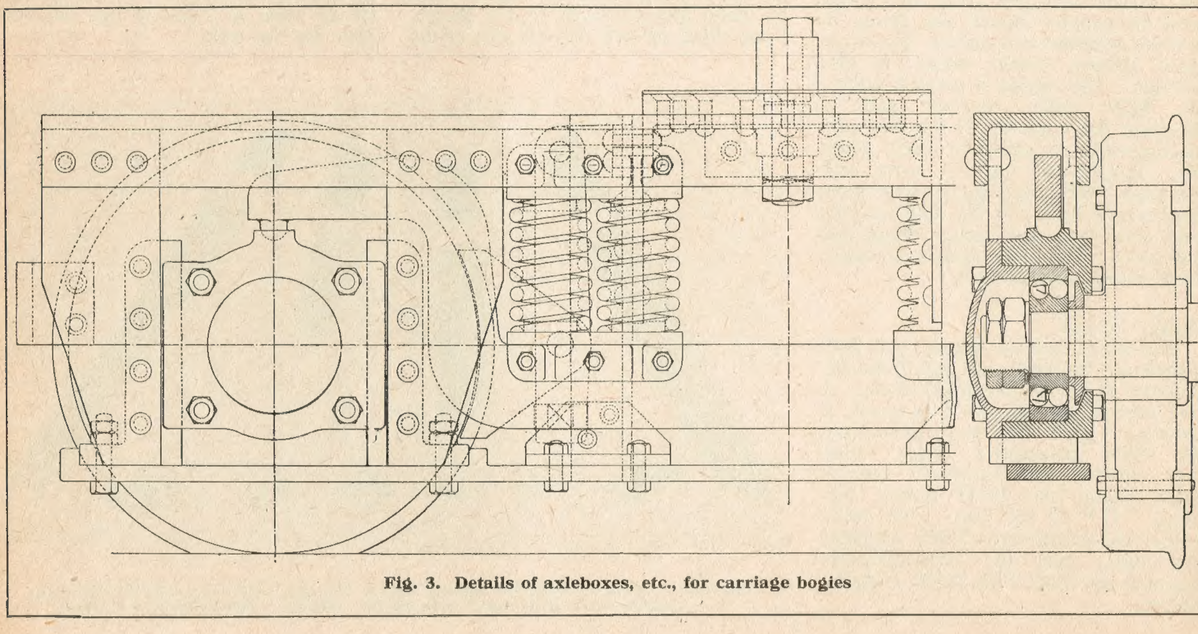


Fig. 3. Details of axleboxes, etc., for carriage bogies

resistance equals only one-seventh of that offered by plain bearings. The starting effort required to move coaches equipped with plain bearings amounted to 21 lb. per ton, whereas with another train of the same weight and fitted with SKF roller-bearings, the starting effort was as low as 3 lb. per ton. Similar tests made in America gave very nearly the same results. Due to the reduced starting resistance either the weight of the train can be increased or the rate of acceleration can be increased, which will result in a reduction in running time. Moreover, the starting effort is not changed by severe cold as it is with plain bearings, but remains constant at all temperatures. By way of summing up, here is a list of the advantages accruing from the use of roller-bearing axleboxes: No hot axleboxes, reduced starting resistance with greatly increased acceleration, reduced running resistance, saving in lubricant, increased reliability, low maintenance costs, saving in haulage power, reduced lubrication labour, and better utilisation of drawbar effort.

Something Drastic

Having these advantages all in mind the writer, when he was asked about two years ago to design a locomotive and complete train for a narrow gauge railway, determined to adopt roller bearings throughout. In the railway companies' previous engines inside frames and plain journals and axleboxes had been fitted, but the experience gained from them in working led the writer to do something drastic; the total number of wheels on the engine was reduced although it was bigger and heavier than the previous two, and the new engine was made with four coupled drivers and a radial truck at each end, thus making the type a 2-4-2. All of the wheels were put inside the frames and the coupled wheels are driven by outside cylinders and cranks. The valve-gear, driving piston valves, is also outside. The engine is carried entirely on SKF roller bearings and in addition the big-ends of the two connecting-rods are similarly fitted, whilst the eccentric-rod big-ends have ball-bearings. The coupling-rods have brass bushes and these are the only working and revolving plain joints throughout the train. It was not thought advisable to fit roller-bearings here.

Tender Wheels

The tender has six wheels, and both wheels and axleboxes are exactly similar to those of the engine radial trucks. A half section through the driving-axle is shown in Fig. 1. For the main bearings the SKF company's series 22300 was chosen, the particular bearing fitted being No. 22311 having diameter "D" of 120 mm. The radial trucks and tender have 21309, diameter 100 mm., and the connecting-rod big-ends are fitted with 21308, diameter 90 mm.

Leading Radial Truck

Fig. 2 is a side elevation of the leading radial truck to which a cross section, taken through the centre of the axlebox, has been added. Both radial trucks have spring side control and the horizontal bearing sliding faces have their centres directly under the main frames.

Fig. 3 is a part general arrangement of one of the carriage bogies with a cross section through one axlebox. Each pair of axleboxes have equalising levers between them. The roller-bearings fitted are SKF Code No. 21307, having "D" diameter of 80 mm. Steam brakes are fitted on the engine, but the braking of the tender and of the train is hydraulic exactly as on modern motor cars, oil being the hydraulic fluid.

Greasing

The design of the axleboxes includes a grease-throwing ring, but in the four main driving axleboxes on the engine the inside of each bearing, next the wheel, there is a felt packing ring carried in a tapered recess and pressed on to the axle by a gland ring; this is provided in order to prevent the possibility of grease reaching the wheel tyre where it would render the action of the brakes less efficient.

Steel is the material of which the axle boxes are made; these are castings, machined all over, and the ends are of gunmetal with the outer faces polished bright. The grease-throwing rings are also of gunmetal.

On the engine the main bearing springs are of the laminated type, and this applies to the radial trucks and the tender as well, but the carriage bogies are carried by equalising levers each provided with four spiral springs arranged in pairs.

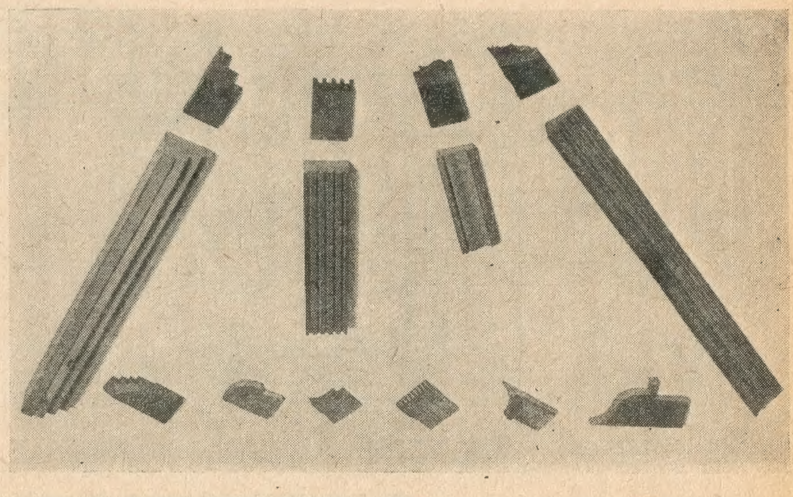
It may be noticed from the drawings that all of the bearings are outside of the wheels. There was a double purpose to be served by this; it gave the vehicles greater rigidity with less liability to rolling on a narrow gauge track and, at the same time, a greater amount of accessibility for examination and, if necessary, repair or renewal of a journal.

A MINIATURE MOULDING SPINDLE

(*Continued from page* 643)

the cutters have a groove filed on them at the upper edge to take the end of the bolt to prevent them flying out.

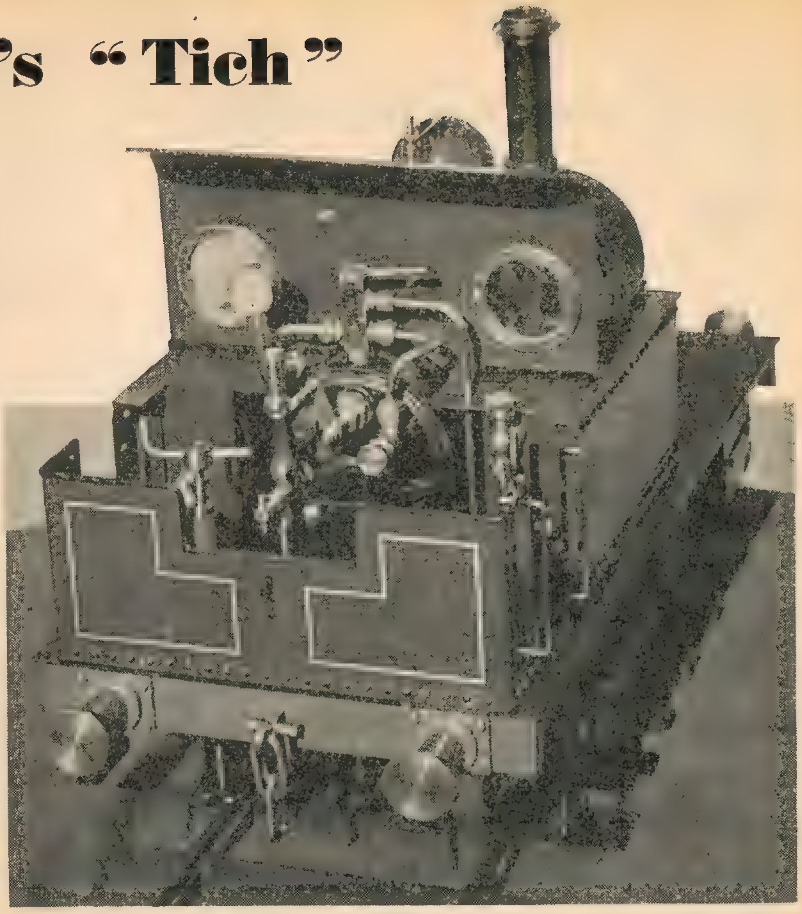
It is with some diffidence that I am sending the description of my machine to this magazine, knowing that experienced model engineers will see its defects at a glance, and be able to think of many improvements to the design. I can think of some myself, one of the most obvious being a better position for the driving pulley, which should be between the bearings, rather than below them. This would require taller bearing blocks, but as the whole thing was made from scrap metal, the design was governed by the material instead of the material by the design. It cost a shilling, all the same, as I had to buy the steel plate for the table !



Top, left to right : Cutter for making flights of steps, cutter for multiple grooves, cutters for architectural mouldings. Bottom : Miscellaneous cutters

A Beginner's "Tich"

By A. E. Lowe

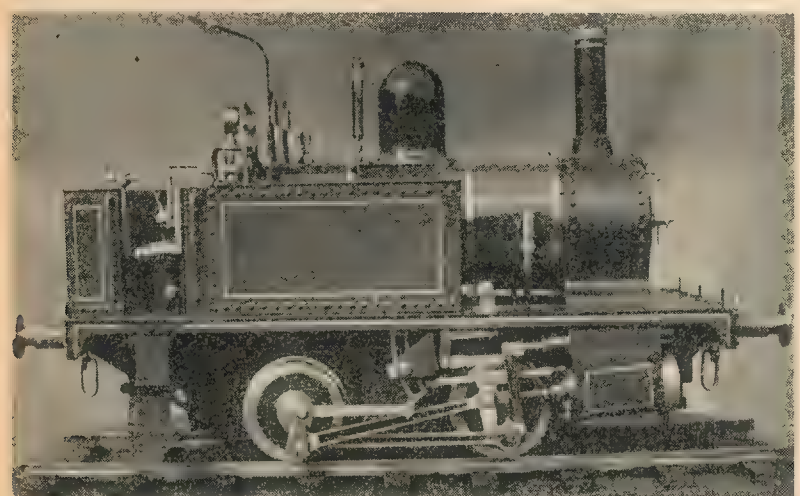


THE engine illustrated herewith is, of course, *Tich*, by "L.B.S.C." Work on it was commenced in June, 1952, when I purchased my first lathe, an M.L.7, and decided to build a locomotive for my first attempt at model-making. *Tich* was picked out, first, because it is a small engine for 3½-in. gauge and, secondly, because I had all the "M.E." serial on this locomotive. Although castings were bought, such as wheels and cylinders, many parts were cut from solid material. Axle-driven pump body, steam and exhaust ties were all machined from bronze bar; the smokebox was cut from ⅛-in. thick steel tube, and the chimney also made from steel tube of smaller size.

The boiler was specified as 18-gauge copper; I had some of 16-gauge, so it was used, with a backhead of 13-gauge. It was tested to 200 lb., using the hand-pump which is installed in the left-hand side-tank.

By September, 1953, the chassis with cylinders and all motion work finished, and the boiler minus a few fittings, were entered in the exhibition held at the Nottingham Victoria Baths, by the Nottingham Society of Model & Experimental Engineers, the society which I joined just before the exhibition was held. To my surprise, it was awarded the "John Dakin" Challenge Cup, and this certainly gave me much encouragement.

The side tanks, weatherboard, and bunker were made next, sheet brass being used for the tanks and bunker, and 16-gauge sheet steel for the weather-board. The tanks were riveted on to brass angle frames, 300 rivets being used altogether, and then sweated in with solder, which ensured a watertight job. One-sixteenth-in. Perspex was used in the spectacle frames and, when highly polished, resembles glass. The straps on the smokebox door, the handrails, safety-valve parts and ashpan are all made of stainless-steel. A few extra items were included during construction, such as working brake gear, lamp-irons, guard-irons and blowdown valve in the lower part of the backhead, which is not seen on the photograph.



All fittings were made, except the pressure gauge which was purchased. The engine was hand-painted by myself, the colour being olive-green. Valspar was used for the boiler (which is lagged with felt), tanks and bunker. The smoke-box, outside frames and running-boards are finished in semi-matt black; the inside frames are red.

The engine has not run as yet on the track, but has proved satisfactory on bench tests. Many pleasant hours have been spent constructing it and much time has been spent making cutters, jigs, etc., to do particular jobs, as I started from scratch. Now, a G.N.R. *Maisie* is well on the way, and much surplus material and tools which were made for *Tich* are coming in useful.

The fine photographs were taken by a friend, Mr. L. Underwood of Beeston, Notts; they were taken out-of-doors, and the reflections of the sun, and trees which lie behind the house, in a wood, can be clearly seen in the dome.

Many thanks are due to THE MODEL ENGINEER and "L.B.S.C." for the help given in the articles appearing each week.

Making a Simple Beam Engine

MACHINING CYLINDER AND STEAM CHEST COMPONENTS

By Edgar T. Westbury

IN the construction of the cylinder and its associated parts, I have specified the use of iron castings, but several readers have objected to this, and have asked if gunmetal or bronze cannot be used instead. My answer to this is that it is up to the individual constructor what metal he uses so long as he does not blame me if expert opinion afterwards condemns his choice. As ever, the main objection to cast-iron cylinders in model steam engines, is the risk of corrosion, but as I have often pointed out, this is very much over-rated, and can be avoided by simple precautions. Some people consider that cast-iron is more difficult to machine than copper alloys—but I have known some specimens of the latter to present greater problems, and cause more tool wear, than good cast-iron. However, " you pays your money and you takes your choice ! "

It will be seen from the cylinder assembly and detail drawings that, while keeping as close as possible to fidelity in the external appearance of the parts, I have taken many liberties in the detail design and assembly in order to simplify construction. For instance, the use of a separate " picture frame " type of steam chest is not strictly in keeping with prototype practice, but it is not obtrusively apparent in the finished assembly, and it avoids some very sticky problems in machining the port seating and the ports themselves, as all locomotive constructors know only too well. The same applies to the use of drilled steam passages, as the long tenuous cored passages employed in the prototype would present difficult moulding problems.

It may be said, therefore, that in general design the cylinder is unorthodox from the

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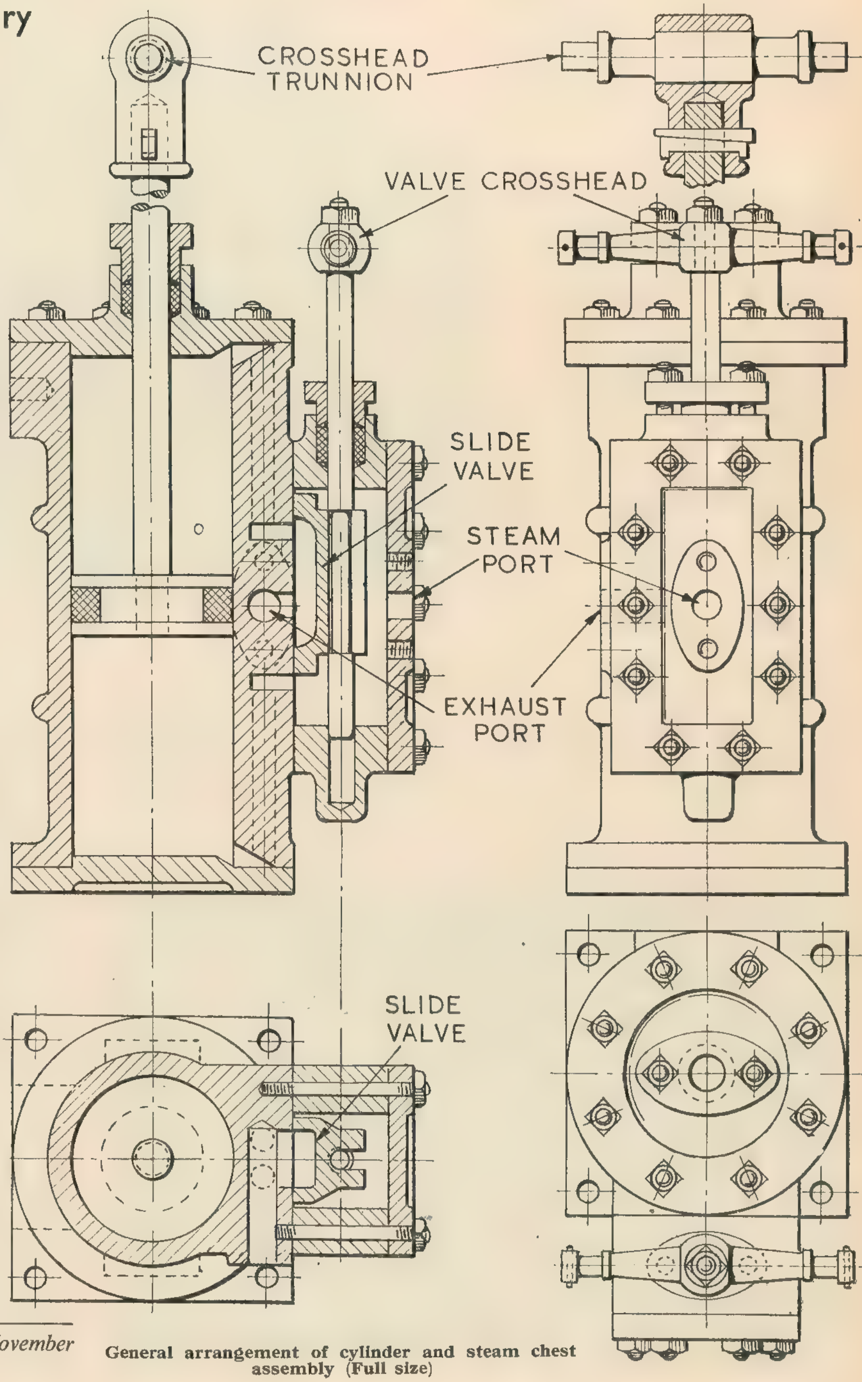
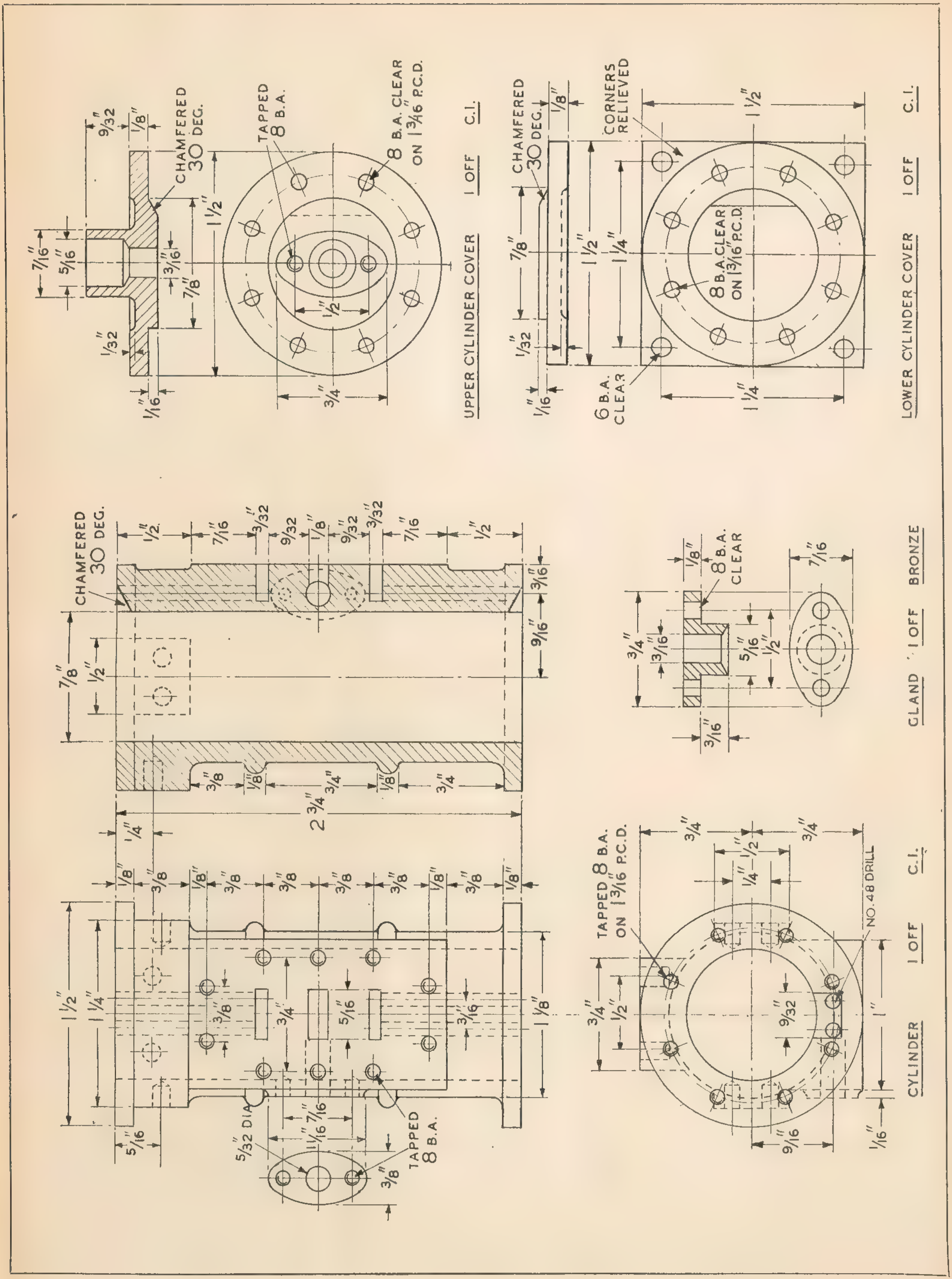
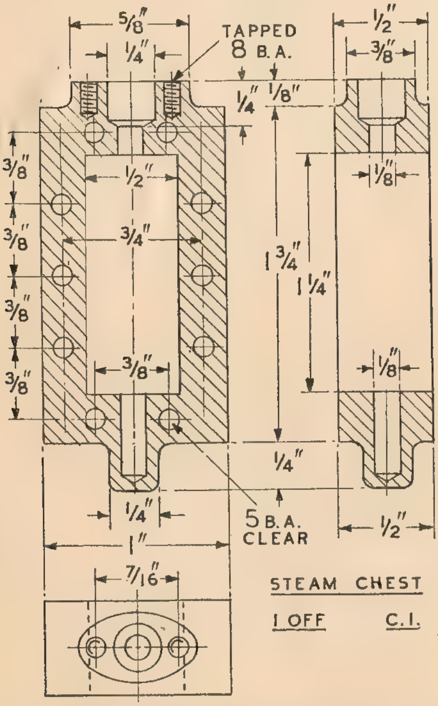


General arrangement of cylinder and steam chest assembly (Full size)


UPPER CYLINDER COVER 1 OFF C.I.
CHAMFERED 30 DEG.
TAPPED 8 B.A.
8 B.A. CLEAR ON 1 3/16" P.C.D.
LOWER CYLINDER COVER 1 OFF C.I.
CORNERS RELIEVED
8 B.A. CLEAR ON 1 3/16" P.C.D.
6 B.A. CLEAR
CHAMFERED 30 DEG.
GLAND 1 OFF BRONZE
8 B.A. CLEAR
CYLINDER 1 OFF C.I.
TAPPED 8 B.A. ON 1 3/16" P.C.D.
NO. 48 DRILL
5/32" DIA
TAPPED 8 B.A.

aspect of prototype practice, but stolidly conventional from the model engineer's point of view. If made from castings as specified, it is quite straightforward to produce; a closer approximation to prototype design could perhaps be obtained by fabricating it, but a good deal more work would be involved.

The cylinder casting can be held in the four-jaw chuck by the top end, using metal packing-pieces over the two side lugs, which are below the level of the end flange, and it may also be desirable to pack the steam chest side as well, to ensure a really firm bearing for the chuck jaws. Bed the flange face firmly against the face of the chuck; if this tends to throw the other end of the cylinder out of truth, some preliminary filing of the head face may be called for to get it reasonably true. The casting will need to be held pretty firmly, at least for the roughing operations on the bore and outer face, in which the initial cuts should be deep enough to get well under the skin, the lathe being run at slow speed in back-gear until these surfaces are cleaned up. Constructors who are lucky or affluent enough to possess carbide-tipped tools will find them extremely useful for jobs of this kind. For the final cut through the bore, the grip of the chuck jaws should be eased off slightly to avoid distortion of the cylinder walls, but this obviously needs to be done with discretion. Leave the bore two or three thou. undersize for final lapping. A double-ended floating cutter makes a useful finishing tool, but I do not recommend using a reamer, though some readers report success with one in work of this nature. In neither case, however, is the need for final lapping eliminated, in my opinion, and in respect of tool finish, it is very difficult to improve on the accuracy which can be obtained by fine cuts with a rigidly-mounted single-point tool. On account of the long bore, it is necessary to take greater precautions than ever to ensure a smooth, parallel finish, but it can be done, with care and patience.



STEAM CHEST

1 OFF C.I.

The cylinder end flange should be faced and turned on the outer edge while set up for boring; the use of a pipe centre may be useful for steadying, it, and I have found the "Monodex" running centre very suitable for such work. For dealing with the other end, the casting should be mounted on a mandrel. The steam chest face can be machined by bolting it to an angle-plate, or between two angle-brackets, on the faceplate, using a single bolt through the bore; and the same method of mounting may be used for milling or shaping the lugs on three sides of the casting, below the top flange. All machining operations should be done before final lapping of the bore.

Any of the methods which have been described in THE MODEL ENGINEER at various times may be used for forming the steam ports, so long as the desired object of producing them in the right place, and with clean edges, is achieved. Despite adverse criticism, I am still very keen on the "gang milling" method, and have produced several successful engines in which this method has been employed. The risk of coming to grief when drilling the steam passages from the cylinder ends into the ports is liable to occur whatever method of port forming is employed, but can be avoided by providing means of ensuring that the drill enters at the correct angle, and does not wander from the set path. In the present case, the holes are drilled dead axially and the problem is thus simplified; they should, of course, be drilled before chamfering the edges of the bore to provide the steam way into the cylinder.

Although, as previously mentioned, there is great difficulty in coring the steam passages in small cylinders, I see no reason why the actual *ports*, by which I mean the straight portion cut into the face at right-angles, could not be cast in fairly accurately by a competent moulder, using modern methods of coring. It should also be possible to cast this with clean edges, at least as good as many constructors manage to produce by the more usual means. Incidentally, a point which is often missed is that the exact position or width of the ports is not really critical, provided that the dimensions and adjustment of the slide-valve are arranged to suit. For instance, if the measurement between the outer edges of the cylinder communicating ports is greater than that specified, the overall length of the slide-valve can be increased to produce the same amount of steam lap; and, if the distance between the inner edges of these ports is less than it should be, the length of the valve cavity can be correspondingly reduced. This assumes that there is enough room in the steam-chest to allow of the necessary dimensional adjustment. The width of the exhaust port is not at all important, as it is not a "control" port at all, and both its size and location may vary within fairly wide limits.

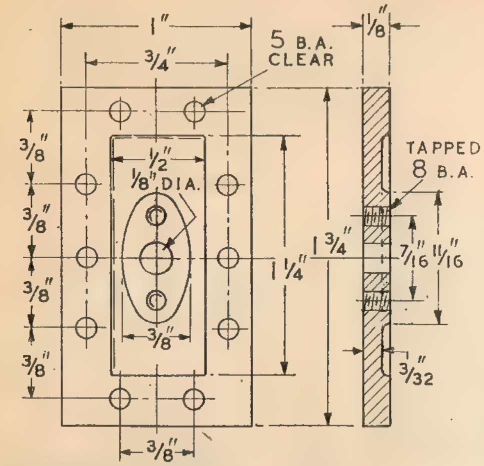
I mention these points because many inexperienced readers have imagined all sorts of problems and difficulties in producing satisfactory steam ports in cylinders, and I have often had to explain at some length that these details are not as critical as they suppose. Even when it is necessary to get the utmost efficiency from an engine, care in compensating errors in initial setting of the ports will produce the desired results.

Cylinder Covers

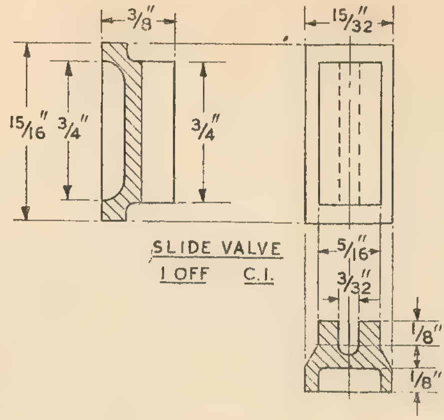
The upper cover can be held by the gland boss for the major machining operations, which can all be done at one setting, including facing, boring, turning the spigot to fit neatly in the cylinder (after lapping), and turning the edge. For facing and counterboring the gland, a pin mandrel may be made to fit the bore tightly and the cover mounted on it for opening out the mouth with an undersize drill and boring to finished size. The angle in the base of the counterbore is not critical, and may be formed by a drill ground in the normal way. A skim should be taken over the face of the flange at the same setting, to provide a true seating for the securing nuts.

An alternative method of machining is to mount the casting initially as before and rough-machine the surfaces, omitting the drilling operation; then reverse, holding it either by the spigot or the edge, for facing, drilling and counterboring the gland, and skimming the flange. It is then mounted on a stepped pin mandrel, which may, if desired, be fitted with a securing nut on the end, for finishing the spigot and joint face. This method embodies the sound machine shop principle of "locating off bore" and should be used if there is any doubt that the central hole may not be perfectly true; but it involves three settings, which should not be necessary for such a simple component.

The lower cylinder cover does not need a centre hole, and thus machining procedure is further simplified. It can be held in the four-jaw chuck, over the edges of the square flange, for facing and turning the spigot; the corners, beyond the edge of the circular joint face, should be faced back a very small amount further to produce a slight



STEAM CHEST COVER 1 OFF C.I.



SLIDE VALVE 1 OFF C.I.

relief. When reversed for facing and recessing the under surface, care should be taken to ensure that the upper face is set truly so that the four corners of the flange are of even thickness when machined. The use of a parallel packing-block between the work and the chuck face will help to ensure this.

Steam Chest

This needs to be faced truly on the two joint faces, and the method mentioned above may be employed to ensure parallelism; an alternative to the use of the four-jaw chuck, for mounting a casting of this type, would be to mount it on the faceplate, with clamps over the end bosses, but it is not easy to arrange this so as to get a clear facing cut right to the corners without fouling the clamps, unless the bosses have extensions cast on them for this purpose. The method does, however, ensure that the two sides are parallel.

The casting may now be mounted on an angle-plate for machining the gland and the tail guide; no difficulty should be encountered with the former, so long as it is set up truly, with the sides of the steam chest square with the surface of the faceplate. It is not very easy, however, to ensure that the drill, after passing through the bore of the gland, will start truly on the inner surface of the aperture to produce the tail-guide. The work should thus be secured to the angle plate in such a way that the progress of the drill can be checked, and, if necessary, corrected, but at the worst, it may be found necessary to bore from the other end, with the steam chest mounted on a pin mandrel, and afterwards plug the end of the hole. A D-bit should be used for finishing the bore, if it is blind-ended; if not, a reamer can be used.

It is not absolutely essential that the slide-valve rod should have a tail-guide, and some constructors may prefer to omit this rather tricky operation, shortening the rod accordingly; but the guide does serve a useful purpose, by ensuring that no angular thrust is taken in the gland, and many small engines which have no such provision would be improved by fitting a guide of some kind, internal or external.

Steam Chest Cover

This calls only for facing on the two sides, with due precautions to keep the surfaces parallel. The bolting holes will, of course, be drilled to correspond with those in the steam chest and the tapping holes in the cylinder; I recommend that the steam chest should be drilled first, and used as a jig for drilling the other parts; but make certain that it is marked to show which way up it is to be assembled, or there is a possibility of errors in the location of holes.

If cast reasonably accurately, the slide-valve calls for no more than facing the front and slotting the back to take the valve-rod, but it may be necessary to file or machine the ends to adjust the steam lap, or to modify the cavity so as to ensure " line-for-line " exhaust cut-off. The working face should be lapped after other operations are complete, and the same treatment should be applied to the cylinder port face, and the joint surfaces on the steam chest and cover.

Castings for the " Vulcan " Beam Engine

In reply to enquiries from many readers regarding the supply of castings for constructing an engine to this design, I am now able to inform them that Mr. W. H. Haselgrove, of 1, Queensway, Petts Wood, Kent, has this matter in hand, but the castings will not be ready just yet, and to avoid inconvenience to both him and prospective customers, I suggest that further announcements should be awaited. In the meanwhile, however, I may mention that he can now supply castings in aluminium alloy for the small geared impulse turbine, which I described recently. Samples of these castings have been submitted for my inspection, and I find them accurate and of good machining quality.

(*To be continued*)

Mr. P. J. Rowe's "Big Little 'Un"

L.B.S.C.'s Lobby Chat

A GAUGE DILEMMA

SOME little time ago, there appeared in these notes, a picture of an industrial switching locomotive, of a type common in U.S.A. before the diesel era; and I offered, subject to our friend the K.B.P.'s kind approval, to describe how to build a small edition, if the type found favour among the followers of these notes. Well, the response has put me in a bit of a dilemma, so I'd better tell you all about it.

Being an ideal job for sharp curves in a small garden, yet able to pull a big load, I naturally thought that there would be a call for the engine in 3½-in. gauge; but that's all I knew, as I only received a few requests for that size, easily counted on my fingers. There was a fair response for the engine in 5-in. gauge, despite the fact that she would be a tidy lump to cart around to club tracks—much bigger than *Minx*, or the 5-in. Great Western 1500 class 0-6-0 tank for which I made drawings. She would also be fairly expensive to build in that size, and special patterns would have to be made by our advertisers who elected to sell castings for it. Sawing bar frames from ¼-in. steel plate might also damp the ardour of more than one over-enthusiastic 5-in. gauge voter! However, that doesn't worry your humble servant; I'm here to do my best for what is called for—but there is a wasp in the jampot. By far the greater response came from our good friends overseas, especially in U.S.A. and Canada. They said O.K., it was about time that I gave instructions for building one of their very own types of engine, and would I please go right ahead—*in 4¾-in. gauge.* That has properly put the tin lid on the job, for the time being. My dilemma now is to scheme out whether to get out the drawings for the engine in 5-in. gauge, which is larger than the "1-in. scale" to which our transatlantic cousins usually build (hence their 4¾ in. gauge) and arrange to squeeze the big engine's frames and components in to suit 4¾-in. gauge where required; or to design her as a 4¾-in. job, and arrange it so that British builders can "spread her out," in a manner of speaking, so that she will run on a 5-in. gauge road. Anyway, I fancy that the best thing to do will be to go into matters and find out which will be the easier; so for the time being, the case will be "sub judice" as our legal friends would say.

Incidentally, this gauge discrepancy business is both amusing and exasperating. Folk in the past who were absolutely crazy about "scale," weren't satisfied with the correct gauge for ½-in. scale, viz. 2⅜ in. but must needs add another ⅛ in. to scrounge a little more width for their fireboxes. This, in turn, wasn't necessary, because at that time they were practically all building water-tube spirit-fired boilers; and the width between frames of an engine built to 2⅜-in. gauge would have been ample. But no—they *had* to make it 2½ in. *Then* they found out that when viewed from the front, their engines looked like bulldogs with their legs stretched out; that immediately "brought the pains on," so they enlarged the whole of the engine to suit the widened gauge, creating cockeyed "scales" of 17/32 in. to 1 ft., or—to complicate matters still further, 13 mm. to 1 ft. The 3½-in. gauge was left severely alone, probably because it was a round number; and as $\frac{1}{16}$ in. equals 1 in. in full size, calculations were easy. But I'm absolutely and completely stumped to know why on earth the 2½-in. gauge antic was repeated, in its complete entirety, in the case of "1-in. scale." When I have been scheming out 2½-in. and 5-in. gauge locomotives, and trying to make them proportionate to their full-size relations, to please friends of Inspector Meticulous, I've thought—and sometimes said—things that wouldn't look very nice if I put them in these notes; nuff sed!

The Eternal Lathe Query

That reminds me: before I get wild and say something really naughty,

Jack Cox's 5-in. gauge "Tailwagger"

about the raw recruit who wrote and asked if he could build *Britannia* on the 1⅝-in. lathe that he had just bought, may I repeat a warning that I have already given several times to beginners. *The fact that a lathe is 2½ in. centres, doesn't imply that 5-in. wheels can be turned on it.* Not on your life ! To turn a 5-in. wheel correctly, without chatter, needs a speed of about 35 revolutions per minute at the most (assuming the wheel to be cast in good quality fairly soft grey iron, with the average amount of "skin,") a correctly-ground tool, preferably of what is known as "high-speed" steel, a lathe mandrel with good hefty bearings, and plenty of power to drive it. Let's get this quite straight, once and for all. Now the driving wheels on my 3½-in. gauge *Jeanie Deans* are 5⅛ in. diameter, equal to the 7 ft. of the full-sized engine; *Grosvenor's* are 5 in. and *Britannia's* are 4⅝ in. All these wheels were turned on my 3¾-in. Milnes lathe. The countershaft of this is driven by a ½-h.p. G.E.C. electric motor, which runs at 1,450 r.p.m. and has a 3-in. flat pulley on the spindle, which drives an 18-in. pulley on the countershaft, via a 1½-in. belt; this gives a countershaft speed of approximately 240 r.p.m. The speed cone on the countershaft is a twin to the one on the lathe mandrel, but is reversed in relation to it, so that the mandrel speeds are two-to-one, one-to-one, and one-to-two. The back-gear gives a reduction of six-to-one, so that in back gear, the mandrel speeds are 80, 40, and 20 r.p.m. The front mandrel bearings is 2¼ in. diameter.

To turn the 5⅛-in. and 5-in. wheels, I gripped them in a 6-in. chuck, and used the slowest speed, with a tungsten-carbide tool, which did the job comfortably, without chatter. The improvised faceplate on which the wheels were mounted for finish-turning the treads was also held in the 6-in. chuck, and the 40 speed was used for the very fine finishing cut, which brought the treads and flanges dead to size; the 80 was tried, but produced a fine ripple. The 4⅝-in. wheels were both roughed and finished on the 40 speed. Now the veriest Billy Muggins, had he seen these wheels being turned as described above, would see at a glance that, to expect to do the job on an ordinary 2½-in. lathe driven by a ¼-h.p. motor, in the same way, would be just fantastic, to say the least of it. It needs a stiff mandrel, power, and the brute strength which a "baby" lathe doesn't possess.

The only way I know, in which an undersized lathe could be made to turn cast-iron wheels of the largest diameter that could be swung in it, would be to fit an extra large pulley on the mandrel, driving it from a slow-speed countershaft, or alternatively using a hand drive. About the simplest and most effective hand drive, would be to borrow the flywheel off the domestic wringer (with the good lady's permission, of course !) and fix it temporarily on the end of the mandrel. Then get somebody to turn it very slowly and steadily, say about 20 turns per minute, whilst the operator performs at the slide-rest. The casting would need to be bolted rigidly to the small faceplate, with the least possible amount of overhang; and the tool would have to be ground just about right, at that. As I have pointed out before, everything has its special use; and while a small lathe is the cat's whiskers for making boiler fittings, turning valves and pistons, axles, crankpins, buffers, machining pump castings, injectors, and the hundred-and-one lighter turning jobs needed in locomotive-building, it cannot be expected to tackle large wheel-turning, nor the machining of things like heavy cylinder castings, with the same facility. I learned my lessons by hard practical experience, while the parents of many of our grown-up readers were still schoolchildren; and experience is still the best teacher.

Gossip

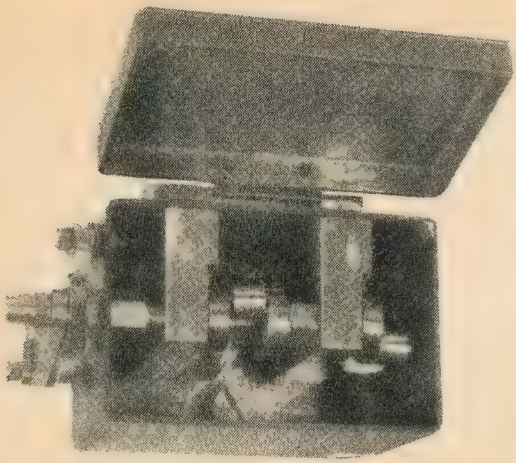
The neat little 0-4-0 tank engine shown in one of the reproduced photographs was designed and built by Mr. Jack Cox, of the Wolverhampton club, following the principles advocated in these notes. Jack is an old correspondent—not in years, I hasten to add !—and wanted a 5-in. gauge job that was reasonably portable, powerful, and able to traverse sharp curves; so he got busy and did the needful. All locomotives with a short wheelbase and fairly large amount of overhang at the trailing end, are liable to lateral oscillation, or a tendency to "wag their tails," as the enginemen say; hence her name, *Tail-wagger*.

However, on the club track she doesn't get much chance to indulge in that sort of antic; going up the 1 in 100 bank with a mixed load of ten passengers—which she does with little effort—keeps her steady. She is complete with all the usual blobs and gadgets, including an injector, and a working donkey-pump of the Weir pattern; this is oiled by a small displacement lubricator, and friend Jack has found exactly the same as I have on my own engines, viz.: when the donkey stops pumping, it is a sign that the lubricator needs refilling.

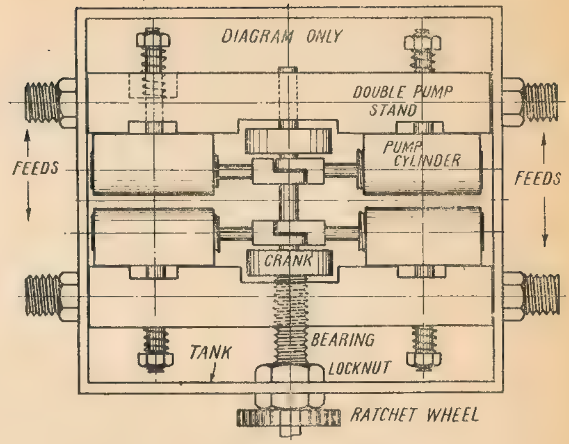
Another picture shows a type of locomotive not often seen in the smaller sizes, having the same wheel arrangement as the *Titfield Thunderbolt*, though she is rather more modern in appearance! This engine is what the kiddies would call a "big little 'un," as she is 7¼-in. gauge, the boiler having a 9 in. barrel containing eighteen ¾-in. tubes. The cylinders are 2⅛ in. bore × 3¾ in. stroke, and the driving wheels are 8 in. diameter; she has all the usual fittings, including pump and injector, and a four-gallon tender. She was built by Mr. P. J. Rowe, of Welwyn, who did a lot of work for the late Mr. J. C. Crebbin, including the designing and building of the four-cylinder compound *Sir Felix Pole*, well known to visitors at former "Model Engineer" Exhibitions. Our friend is now busy with a 5-in. gauge G.W.R. *Hall* class engine, which is now well advanced, and should turn out a powerful job.

Quite a fair number of British engine-drivers work the "busman's holiday" stunt, and build little locomotives in what spare time they get; but there aren't many of the fraternity in U.S.A. who are interested enough to do likewise, especially in these days of diesels, which are, alas ! fast driving steam locomotives right off American rail-

A Mighty Hauler of the Espee, built by Jack Tesco



Bob Hannum's twin-feed lubricator



Plan of suggested four-feed lubricator

roads. One of the few is Jack M. Fesco, of Los Angeles, who is an engineer on the Southern Pacific (our cousins call it the "Espee") and also a member of the Southern California Live Steamers. Incidentally, I'm a member too, though I don't get any chance to attend the meetings! Jack's small edition is shown here, although the leafy background rather spoils the picture, but it shows that she is a pretty hefty specimen of a S.P. 4-8-2, with Vanderbilt tender all complete. The picture shows the power reverser, also the mechanical lubricator. I have asked Jack to get a good clear three-quarter front view, and a few close-ups of details, as she is a real good job, worthy of notice; and the details might be of use to others who are building American-type locomotives. They include both ball-bearing and roller-bearing axleboxes, "Everlasting" blowdown valve, Franklin butterfly firehole door, Consolidation safety-valves, and a few other interesting features.

Multifeed Mechanical Lubricators

Three or four readers have commented on the lubrication arrangements of Alan Giffard's "spamcanette," asking if he had any special reason for fitting three separate mechanical lubricators, and suggesting that one tank with separate pumps in it would have been easier. They point out that full-size lubricators are made with as many as ten separate feeds. Quite true, they are; but the relative sizes of the oil-box, and the battery of pumps inside it, is far different in full size, to what it would be on a little engine. I have described, in previous notes, how to make a lubricator with two pumps in it, on the V-twin principle, using a single crank; and have also used them on my own engines. The compound has one with different-sized pumps. The Mallet had one as well, but this has now been replaced by a single pump, as I found that the twin fed far too much oil. Alan didn't say why he fitted separate lubricators to his engine, but probably it was because the big ones had them. They were as wasteful of oil, as they were with coal; once, when I mentioned to a driver friend that I had run out of cylinder oil and was ordering some more, he said: "Don't bother; take your can, start at Cannon Street, and you'll be able to get enough off the ballast to fill it, long before you reach New Cross!"

However, joking apart, several readers have made mechanical lubricators with two and three pumps in them, which have worked very satisfactorily. I haven't a photo, at the moment, of a "triplet," but here is one of a twin, made by Bob Hannum, of Portland, Con., U.S.A. and fitted to a class "5" Erie 4-6-0 which he is building. The pumps are of the usual oscillating-cylinder type, as described in these notes, one being driven by a disc crank, the pin of which is extended to drive another disc, which in turn operates an extension shaft carrying a crank which drives the second pump. This arrangement works quite well.

As most followers of these notes know by this time, I never introduce complications where they can be avoided; and if a single or twin-feed lubricator will do the job, same is specified. At the same time, if multi-feed lubricators are called for, I am perfectly willing to oblige with the "gen." For example, it would be a fairly easy job to make a four-feed lubricator for a 3½-in. or 5-in. gauge locomotive, having an oil-box of reasonable size, by using two flat-twin pumps side by side; and only one crank would be necessary to drive all four plungers, if the pumps were erected in the box with the cylinders towards the centre, and the port blocks outwards, towards the sides of the box or tank. The four delivery valves would be screwed through the sides of the tank, into the end of the port blocks; and as these would be clear of the bottom of the tank, short bits of pipe would be needed, screwed into each inlet hole, and reaching to the tank bottom, to enable the pumps to lift the oil when the level became low.

Full-sized Wakefield and other lubricators employ a slide crank to drive the plungers or rams, the pump barrels being placed in a sort of double bank, ahead of, and behind the crank. All the rams are connnected to the one slide. I wouldn't recommend this arrangement in the small size, as it entails weeny valves, which work very sluggish in thick oil. It was because of this, that I finally adopted the oscillating cylinder as "standard."

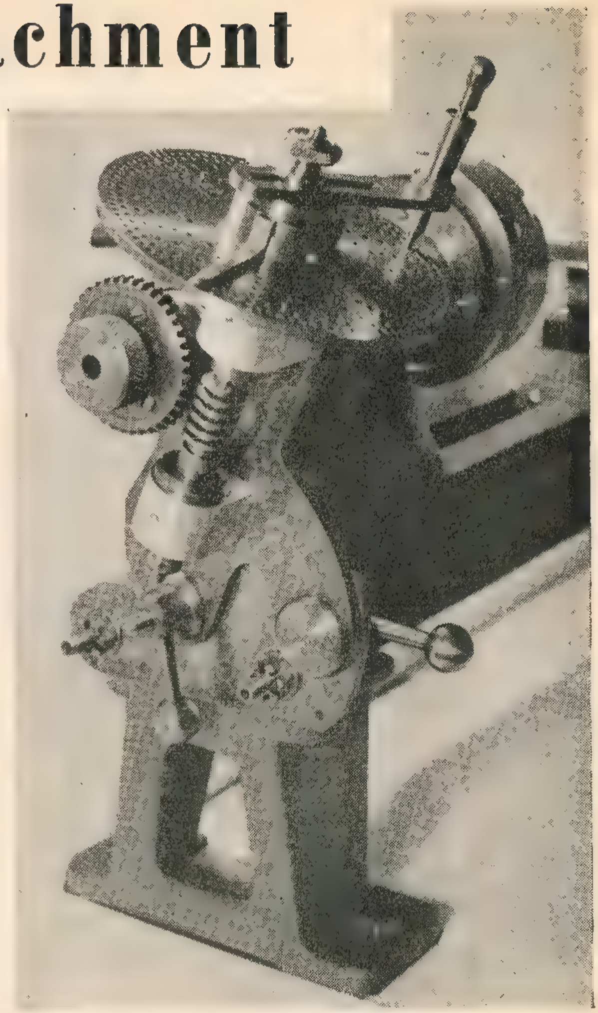
Tail Lamp

May I collectively thank all the readers of these notes who were kind enough to send congratulatory messages on the completion of my thirty years' non-stop run. There were plenty of them; one very enthusiastic brother sent a greetings telegram, saying that he hoped I would carry on for another thirty—bless his heart and soul, I don't!! Although I hope to carry on while I have the health and energy (provided that "words and music" are still in demand) there comes a time when we all need a rest from our labours; it may be distant, it may be soon, only Fate can tell.

Those good friends who were very tickled with my list of correspondents may like to know that in addition to those mentioned, I have received letters from Old and Young, by Day and Knight, from North, South, East and West, in Spring, Summer, Fall and Winter.

A Dividing Attachment for the G.A. Lathe

By G. Blaney



Showing the dividing attachment fitted to the end of a lathe

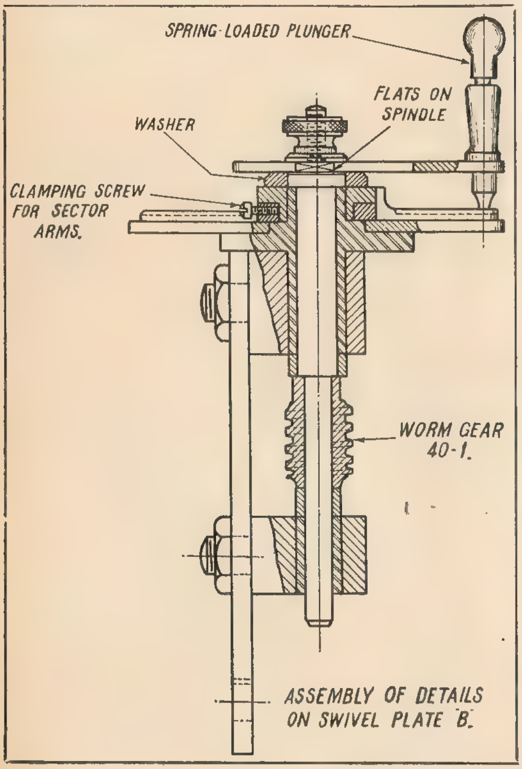
DURING the past, many types of dividing heads have been described in THE MODEL ENGINEER and these have been found most useful in getting out the present design.

There is nothing original in this particular design; however, there are one or two elements of novelty, which may appeal to readers contemplating making a similar apparatus, especially for a lathe of $2\frac{1}{2}$ in. centre.

It is intended to fit a G.A. $2\frac{1}{2}$ in. precision lathe, and if well made, will add considerably to the appearance of this particular machine, and will fully justify making. It is very compact, rigid, and efficient in use, and with its seven rows of holes given for the division plate, covers a wide range. It is made to fit permanently to the lathe, and can be thrown in or out of gear at will; in no way does it interfere with the normal functioning of the lathe, and it can also be fitted to other lathes of this size.

In the case of the G.A. lathe, it was considered undesirable to do any drilling for its attachment, so two bracket bolts were made, and the existing bolt-holes fastening the lathe bed to the feet were used, one front, and one back.

Now these particular bracket bolts have been mentioned, they can, with some advantage be made first, and the general construction described afterwards. The dimensions of these bolts are clearly shown on the drawing, and they are made from $\frac{5}{8}$ in. × $\frac{5}{8}$ in. bright mild-steel, held in the 4-jaw chuck, turned down to $\frac{1}{4}$ in. diameter, and threaded 26 threads per in.; then drilled for the holding-down bolts. Care should be taken to see that they fit tightly up to the sides of the lathe bed, and they should stand proud of the end of the lathe by about $\frac{1}{16}$ in. Remove the existing bolts, and replace with two more, only $\frac{3}{8}$ in. longer. When fitted, the bracket bolts should measure $2\frac{5}{8}$ in. across the centre of the threaded shanks to accommodate fixed plate *A*.



A start may now be made on the plate work; for this purpose, a piece of 2 in. wide by 5 in. long and $\frac{3}{16}$ in. thick bright mild-steel is used. This is for fixed plate *A*, which should be made first, and carefully marked out to the dimensions shown on the drawing. After squaring one end and one long edge, if these are used as datum lines, little difficulty will be found in the marking out. Finally, cut and file to shape, and fit to bracket bolts already attached to lathe.

Next a start may be made on the swivel plate *B*, which is also made from $\frac{3}{16}$ in. thick material. A piece about $5\frac{1}{2}$ in. long by 3 in. wide will be required. Square one end and one long side, and use these as datum lines for marking out. This particular plate is more difficult to make than plate *A*, and is intended to carry the whole of the worm gear, etc. Care again is essential in marking out. All drillings at this stage may be completed, including the dowel holes, which will serve as a jig for drilling the bearings; be careful not

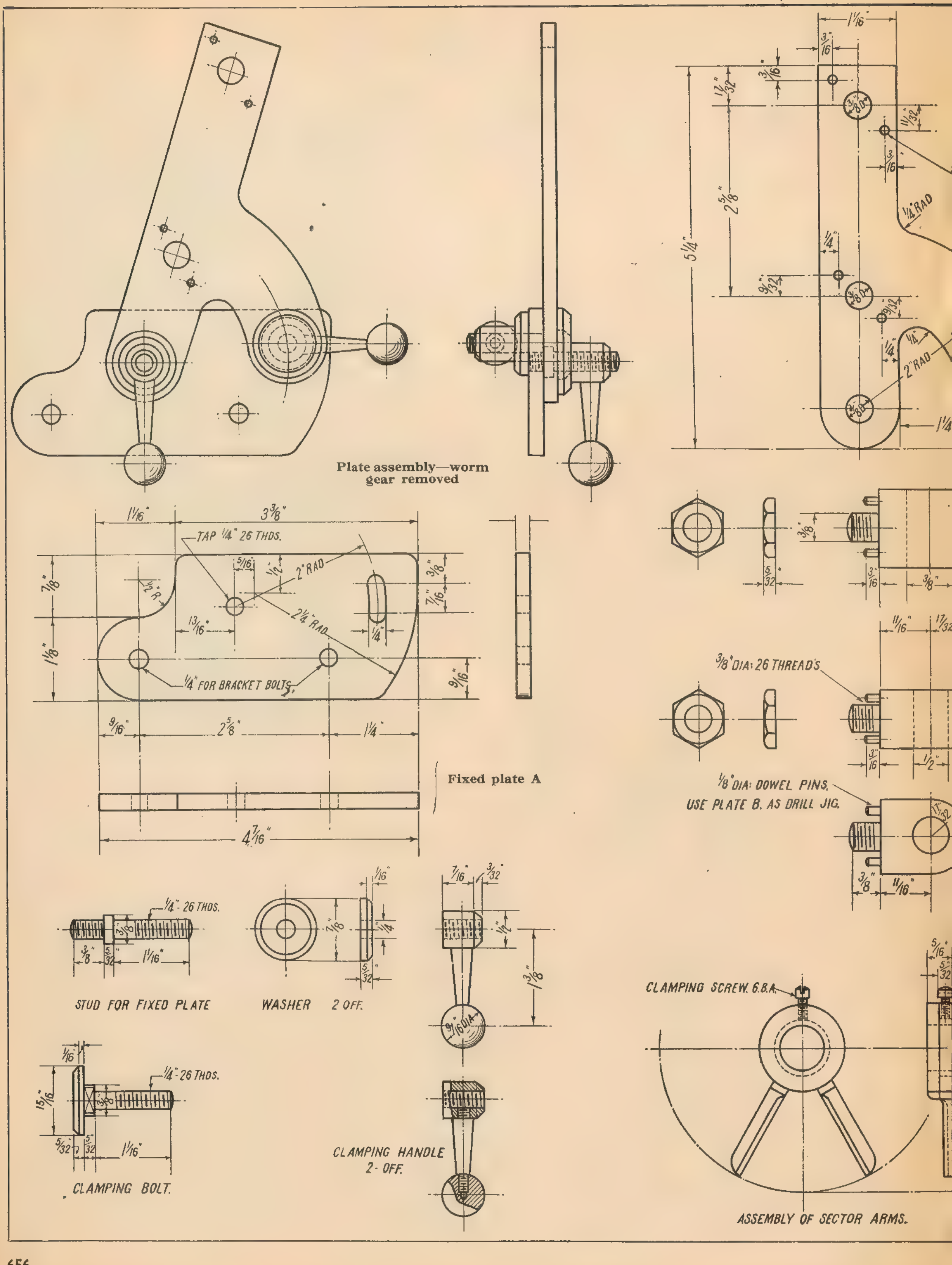
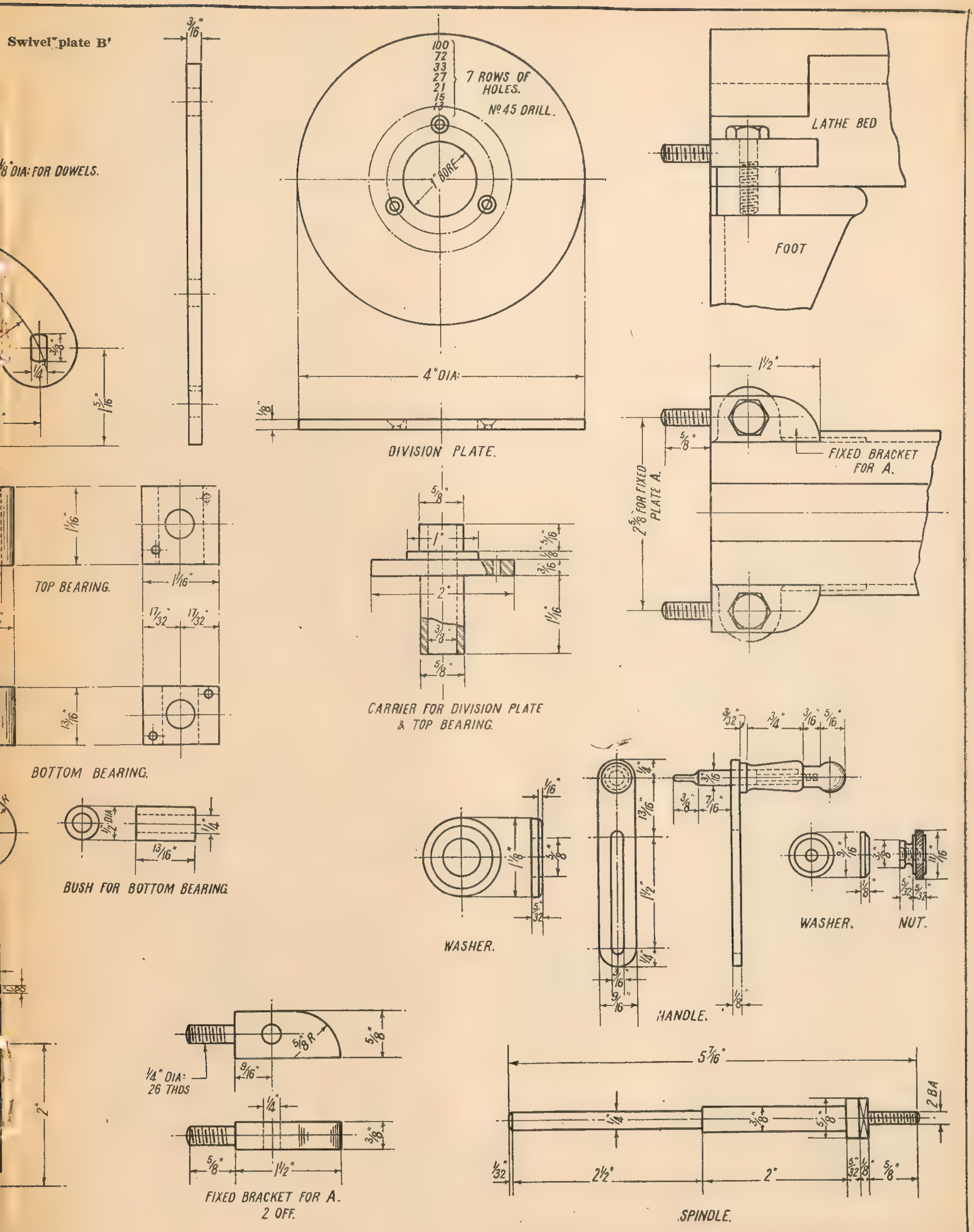
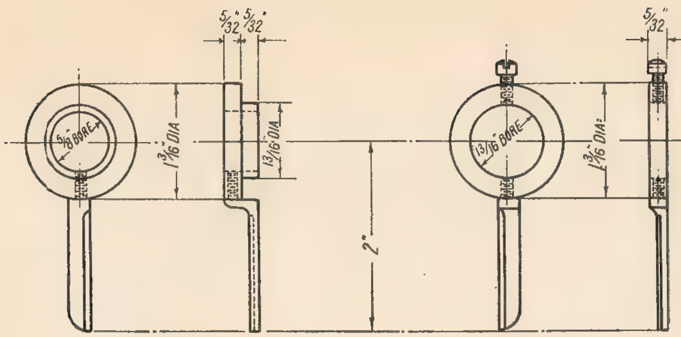


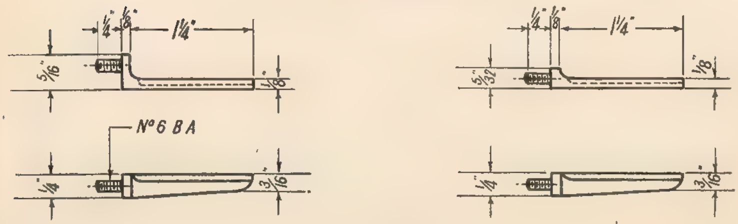
Plate assembly—worm gear removed

Fixed plate A


Swivel plate B'
DIA: FOR DOWELS.
7 ROWS OF HOLES.
Nº 45 DRILL.
100
72
33
27
21
15
13
1" BORE
4" DIA.
DIVISION PLATE.
LATHE BED
FOOT
FIXED BRACKET FOR A.
2⅝" FOR FIXED PLATE A.
TOP BEARING.
BOTTOM BEARING.
BUSH FOR BOTTOM BEARING.
CARRIER FOR DIVISION PLATE & TOP BEARING.
WASHER.
HANDLE.
WASHER.
NUT.
¼" DIA: 26 THDS
FIXED BRACKET FOR A. 2 OFF.
2 BA
SPINDLE.



SECTOR RINGS & ARMS.



SECTOR ARMS.

to distort this plate when cutting out.

Incidentally, I find "chain-drilling" helpful in this direction, especially on small curves, using $\frac{1}{8}$ in. holes, and a double centre punch for marking the centres, with the punch points pitched at $\frac{3}{16}$ in. centres. Such a punch is easily made by drawing out a piece of $\frac{5}{16}$ in. diameter silver-steel similar to a flat chisel, and then file in the centre points. The holes can then be broken through by using an "Abrafile" in the hacksaw frame.

Next the clamping-bolt, stud, handles and washers may be made. These are made with large diameters to prevent any springing of the plates when clamped together. The drawings show these details quite clearly, and need little comment. It should be noted, however, that the ball-handles are built up. Two $\frac{9}{16}$ in. diameter steel ball-bearings should be obtained from the local garage, placed in the fire overnight, and thoroughly softened, after which they are held in the 3-jaw chuck, and drilled and tapped $\frac{1}{8}$-in. Whitworth. Drill as deep as possible to avoid a shallow "blind hole" and consequently broken taps.

Whilst still in the chuck, take a very slight skim over the top of the hole, so that the shoulder of the shank will butt up closely when screwed home. A similar procedure is adopted for the nut portion; this, however, is held in the vee-block and drilled and tapped 5/32 in., 40 threads per in. When the shank is screwed home, do not use excessive force. The result will be a very neat ball-handle, and it will be difficult to detect that it has been built up.

Having finished the bolts, etc., the plates may now be fitted together as shown in the assembly drawing, to see that it swivels without binding.

A start can now be made on the top and bottom bearings, which, as the drawing show, are identical in all respects, with the exception of the bottom bearing which is thinner. There is nothing difficult in machining these; both are made of dural for lightness.

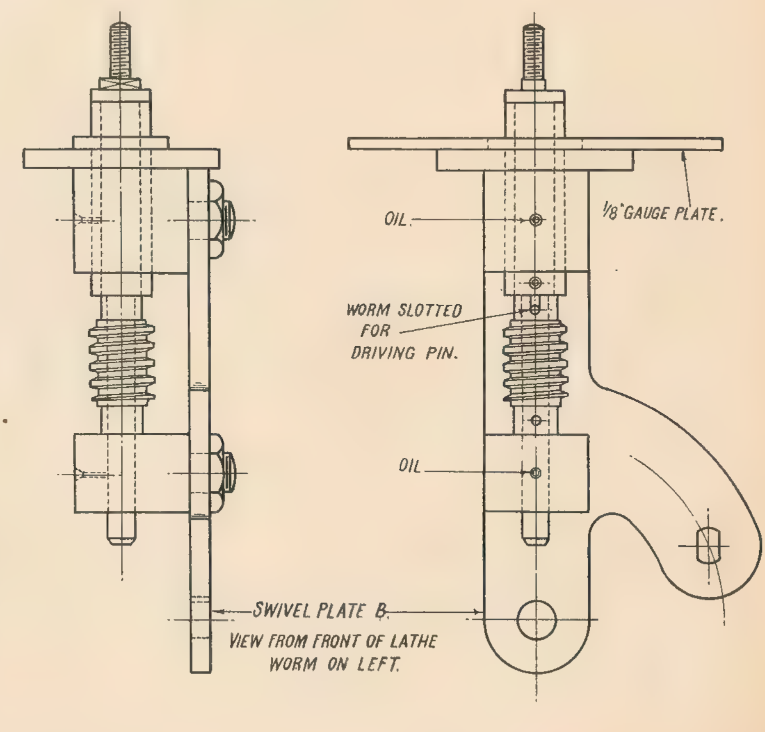
After boring for the bushes, they should be faced on a mandrel so as to get the faces true with the bore. For this purpose, a mandrel should be turned, preferably between centres, from a piece of steel just over $\frac{5}{8}$ in. diameter, and about 6 in. long. Turn one end $\frac{5}{8}$ in. diameter, 3 in. long, a light drive fit for the top bearing, and the other $\frac{1}{2}$ in. diameter and 3 in. long, a light drive fit for the bottom bearing. Face both bearings between lathe centres, and after removing the bearings, ease the mandrel to a nice push fit in the bearings.

Next fit both in swivel plate *B*, using two temporary nuts of small diameter, to leave the dowel holes clear for drilling. Insert the above mandrel so as to get the bearings in perfect alignment, tighten the nuts, and using the plate as a jig, drill the dowel holes. Keep the mandrel, as it will be required for the spindle.

The carrier for division plate and top bearing can now be made; a casting in gunmetal could be obtained for this. As the drawing shows, it is also a plain turning and boring job. A $\frac{3}{8}$-in. reamer should be passed through the bore to finish it, and it should be a light force fit in the top bearing for its full $1\frac{1}{16}$ in. length. Also, fit the bottom gunmetal bush, which is $\frac{1}{4}$ in. bore.

The division plate can be fitted at this stage, and is quite a simple job. It is best made from $\frac{1}{8}$ in. thick ground steel gauge plate, and will be best "chained-drilled" and filed roughly to shape, then held in 4-jaw chuck and bored to fit the $\frac{1}{8}$ in. thick spigot on the carrier.

(*Continued on page* 664)



VIEW FROM FRONT OF LATHE WORM ON LEFT.

Home-made Minnows for Angling

By W. M. Short

TROUT angling being my summer sport, I am at present busy in my workshop making a supply of small gold minnows for the new season. I have used this type of minnow to the exclusion of all other artificial baits for two years now.

Having lost scores of commercial "devons" during my fishing trips in the past, each of which cost me from 2s. to 3s. 6d., I decided to construct my own. Not only did they turn out cheaper, but, as many of my fishing friends will testify—they did the job better. I've always found the commercial "devons" too dull, and unsuitable for polishing, the spinning blades too conspicuous, and invariably made too big for trout.

The following points, therefore, were kept in mind in the design of this type of minnow: They must be easy and cheap to make (completed, they cost about 7d.); they must have a turned body made of brass, which facilitates polishing when this is necessary; spinners must be of transparent material and easily attached to the body in one piece; the components of the mount must be easily obtained from the tackle merchants.

A form tool (shown in Fig. 2 with the cutting edge down) is shaped up from an old 1 in. file about ¼ in. thick, the tang portion being utilised as the shank. After annealing and removing the old teeth from one of the flats, a template is cut from card to conform to the body curve shown in Figs. 1 and 3. This is used during the shaping, but bear in mind that this tool is used from the rear of the lathe, inverted. No top rake is required, but, adequate front and side clearances must be given to the cutting edge. Harden and temper this tool and grind after, if need be; then finish by hand stoning to a really sharp edge. These operations are the hardest part of the work and are worth taking pains over, as a well-made tool will make hundreds of minnows and needs only a touch up now and again.

Mount the tool in the rear toolpost, cutting edge on dead centre—not lower! Chuck a length of ¼ in. diameter brass rod with approximately 1¼ in. protruding and face end. Mount a combination drill with 5/64 in. points in the tailstock drill-chuck and feed in until the taper portion just enters the material. Stop and apply a touch of grease to the drill point after which feed in until the rod is securely supported. Clamp tailstock barrel.

Swing rear toolpost until form tool is brought to the correct angle for forming the body. Before cutting, lock the saddle, and be sure the toolpost is securely held. During the forming cut, the workpiece is supported by the centre drill and I use middle open speed on my M.L.7. This is not good practice, but it works and saves much time. Stop cutting as soon as the last portion of the body touches the cutting edge.

At this point the tail end of the tool should be almost fouling the centre drill. A couple of trials may be advisable to leave the correct diameters at their respective ends of the body. Once found however, it can be kept until your batch is produced. The finished body will be slightly less than ¼ in. at the thickest part, this part being nearest the headstock. Remove centre drill and drill to 1 1/16 in. depth with a 7/64-in. drill. Avoid wandering. At this stage bring to the required degree of brilliance with metal polish. Finally, part off to 1 in. length with a tool pre-set in the front toolpost.

The spinner is a small oblong piece of celluloid cut ¾ in. × ¼ in. from 1/32-in. sheet and drilled centrally ⅛ in. diameter.

(*Continued on page* 661)

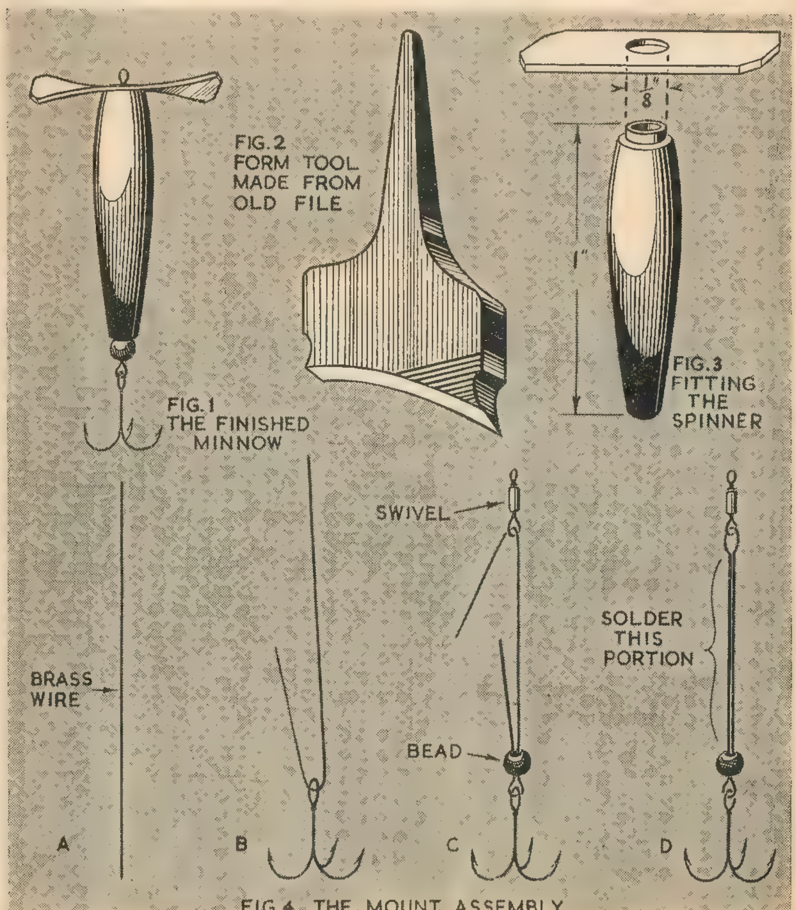


FIG. 4 THE MOUNT ASSEMBLY

Rootes Group Training Schemes

By J. Dewar McLintock

Fitting a crankshaft in the specially lined bearings of a Humber engine

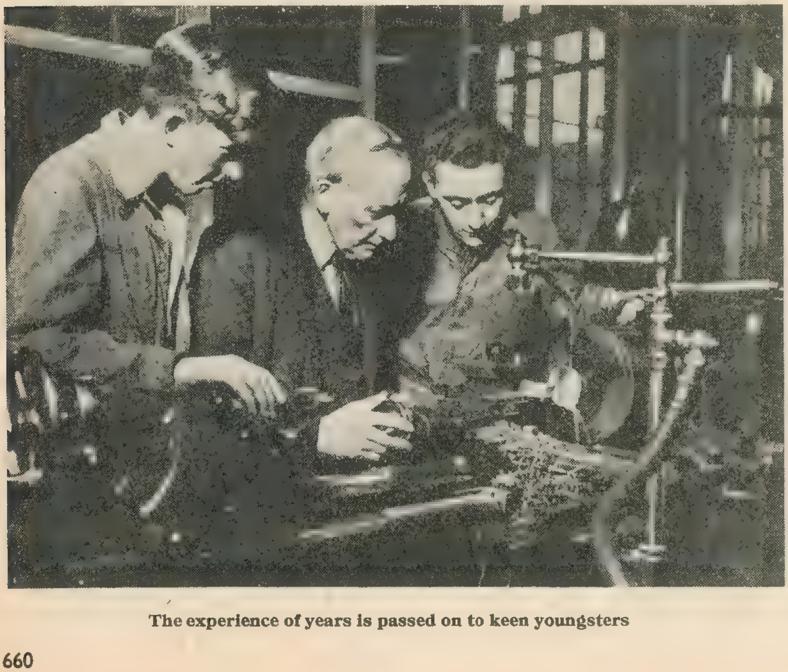
IT is somewhat refreshing to note that the following is included in the prospectus of the Rootes Group Training Schemes: " By an ancient charter, apprentices sérving under indentures in Coventry for five years may qualify for admission to the Roll of Freemen of the City. Subject to good conduct and satisfactory progress during the term of indentures, they are sworn in at the Freemen's Court and granted a Certificate of Freemanship in the traditional form."

This is perhaps symbolic of the importance attached to the initiation of young men into the dignity of craftsmanship, by an influential and prosperous section of the motor industry.

As many will know, the Rootes Group are manufacturers of Humber, Hillman and Sunbeam-Talbot cars, as well as Commer and Karrier commercial vehicles, and it is understandable that they have at their disposal exceptional facilities for engineering research and technical development. Not only are there the main vehicle-manufacturing plants and their allied research and development departments, but there are steel-pressing and quality coach building factories, whilst the London service organisation is so large in scope as to amount almost to an industry in itself.

" Youth," states the Group, " is the time of unbounded enthusiasm and limitless ambition, and to youth the Rootes Group offers the opportunity of making plans which can be realised—plans which will ensure the development of a career in an organisation whose activities and reputation are world-wide."

Headquarters of the scheme are the two factories at Coventry and Ryton-on-Dunsmore, whilst Luton offers fully comprehensive training in connection with vehicles ranging from small to large vans and specially-designed transport vehicles. All branches of presswork are dealt with at Acton, the home of British Light Steel Pressings Ltd., whilst those who choose coachbuilding will, it is stated, find that the art, far from being decadent, still flourishes at Thrupp and Maberley Ltd., in London, and the skill imparted by years of devotion to a craft is theirs to acquire



The experience of years is passed on to keen youngsters

The scheme is officially described as a pupil and apprentice training scheme and this implies that it is divided into two categories. Pupilage consists of training for boys of 17-18 who have reached matriculation standard, a knowledge of chemistry, physics, etc., being desirable. Apprentice training, on the other hand, normally starts at the age of 16, and training is given in one of the following groups: (1) Toolmaker, machinist and fitter. (2) Automobile fitter and mechanic. (3) Works chemist. (4) Works electrician. (5) Sheet metal worker. (6) Automobile draughtsman. (7) Prototype body maker.

Boys who have made good progress at a modern secondary school are eligible for apprenticeship, but preference is given to boys from junior technical schools and established secondary schools. A limited number of suitable boys may join the scheme under the age of 16, when they will serve as probationers.

All applications are considered in the light of the vacancies which exist, and whenever possible the applicant will

An apprentice receiving instruction in the use of optical precision instruments

be asked to present himself at the company's office in Coventry, where, after a written examination, he will be interviewed by a committee of executives of the company. All applicants have to produce their latest school reports or a reference from the headmaster. Parents are allowed to accompany their sons, but cannot be present at the interview. All boys are required to spend the first three months on trial, but wages are paid from the start.

Whilst all courses involve practical workshop experience in the various departments, the centre of the training scheme as operated at Coventry is a well-equipped pupil and apprentice school, where a staff of full-time instructors is maintained. The school workshop is also equipped so that progressive training can be given, and boys in most groups return to the school during their factory training so that their progress may be checked and individual advanced instruction given to meet each boy's needs. Certain instruction can best be given in the form of set exercises, but wherever possible the work done in the school is of use in the factory so that each boy takes a pride in his work, and the interest engendered creates its own enthusiasm.

All pupils, apprentices and probationers must attend the technical college, and whenever possible a part-time day course is undertaken and wages paid during this attendance. All boys are expected to pay close attention to their studies and attain one or other of the following qualifications: External B.Sc. degree of the University of London; the Ordinary and Higher National Certificate in automobile, mechanical, production or electrical engineering; the Final City and Guilds Certificate in the appropriate trade.

From a very thorough and constant system of reports, a quarterly efficiency rating is individually assessed and a report is sent to each parent each quarter. The future career of a pupil or an apprentice depends largely upon his general conduct and ability to apply the training he has received. Every effort is made to absorb all promising young men into the organisation, subject to the stipulation that no guarantee of future employment can be given upon entry into the scheme.

Whilst boys normally resident outside the Coventry neighbourhood may select their own accommodation, the company is prepared to assist in this matter and ensure that suitable accommodation is available.

The company is most concerned that all pupils and apprentices should be physically fit. All boys are regularly examined by the company's medical adviser, who is then able to decide if the boy is receiving the maximum benefit from the regular physical training classes which form part of the training curriculum.

With its long and intensive experience of works relations, it is not surprising that this company appreciates the importance of such factors as welfare, physical fitness, sports and entertainment facilities, etc., and all such benefits are enjoyed by students and apprentices.

Finally, it must be made clear that boys undergoing training and making satisfactory progress at the Technical College may defer their military training until their apprenticeship ceases, and all boys are encouraged to avail themselves of this concession.

HOME-MADE MINNOWS FOR ANGLING

(*Continued from page* 659)

To attach, slide minnow body on to the drill in the tailstock chuck with blunt end to the right, and slide the whole bunch up until the work can be gripped lightly, but firmly in the chuck. Leave a little protruding, and with a knife tool turn about 3/64 in. off the head to leave a diameter sufficient to grip the spinner which is next pushed on. The thin brass wall thus formed, concentric with the bore of the minnow, is then spun outward with a suitable burnishing tool. By carefully rocking this hand tool, with the lathe at high speed, the edge can be turned completely over, imprisoning the spinner securely.

Sharp corners are now trimmed off and the bait held in a steam jet when the celluloid will become soft. Grip between the thumb and forefinger of each hand and twist the blades, airscrew fashion. Cool off in cold water, holding everything meanwhile. In a second or so they will set. When making a number of minnows, twist half of them clockwise and the others anti-clockwise. Line kink can thus be counteracted. Spinners which tend to slacken during the steaming operation only require a light tap on the centre to secure.

Having bought some eyed-trebles—not too small—some good brass wire as used in the watchmaking trade approx. 0.020 in. diameter, and the smallest barrel swivels you can obtain, proceed with the mount as in Fig. 4. When the finished mount is in position only the loop of the swivel should be seen. The thick black central part in Fig. 4D represents the portion of wire which is joined by solder.

The ends of the wire are brought together midway between the swivel and the bead, and held during soldering by a pair of sharp-nosed pliers. I have caught sea-trout up to 5 lb. weight, and the mount seems quite capable of standing up to the strain. The treble hooks must be left free to swing in their loop, so do not let any solder interfere here.

The soldering operation is greatly speeded up if the wires are first bound with fine copper wire. By adding more turns and more solder the weight can be varied to suit the individual.

Lastly, I never paint my minnows, as I consider this a waste of time, but in any case one should be sparing with paint, allowing some gold to shine through and merely tinting it. Any paint should only cover a little over a quarter of the body surface.

Additions to the Shaping Machine

By "Duplex"

EVEN in a well-designed and accurately-made machine tool the user, more often than not, finds that he can make alterations in detail, either to suit his own particular preferences or to facilitate the carrying out of ordinary machining operations.

With the shaping machine tool-slide illustrated, it was found that the small feed-handle originally fitted made moving the slide, for anything but a very small distance, somewhat laborious.

The small leverage provided enabled this handle to be turned with a continuous motion, only if the slide itself was kept slackly adjusted; but this tended to introduce machining inaccuracies, as the slide was pushed upwards by the pressure of the tool and was free to fall over the range of backlash present in the feed mechanism. However, a machine slide should always be kept properly adjusted to give both accurate and free working. The difficulty in operating the slide was, therefore, overcome by replacing the handle of $1\frac{1}{8}$ in. effective radius by one giving an increased leverage corresponding to a radius of $2\frac{1}{2}$ in.

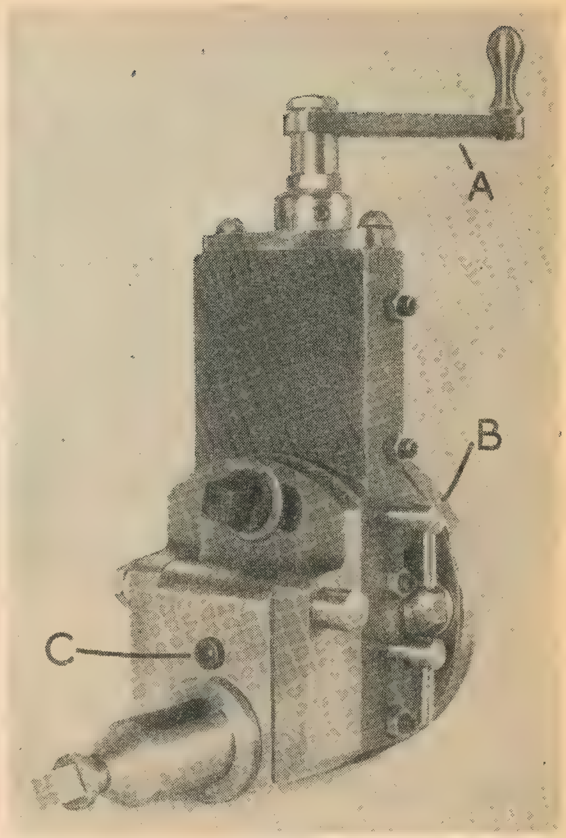


Fig. 1. The shaping machine tool-slide. A—the new, long feed handle. B—the slide locking-screws. C—the clapper-box fixing-screw

The original handle has secured to the feedscrew by means of a Woodruff key and a lock-nut, and, to avoid making the new handle with an extended collar to engage the feedscrew, it was made thick enough to take a bearing on the key. The intervening space between the thrust-adjusting nut and the handle was then filled by fitting a distance-collar. As shown in the drawing, the big-end of the new lever is drilled to receive the end of the feedscrew, and a keyway is afterwards filed to a good fit on the Woodruff key. After the distance-piece has been drilled axially, a keyway is also filed in it, but this need not fit accurately, as this collar plays little part in transmitting the pressure applied to the handle. When cutting a keyway of this kind, it should generally be sited where there is the greatest amount of surrounding metal, in order best to resist the bursting strain set up under unfavourable working conditions.

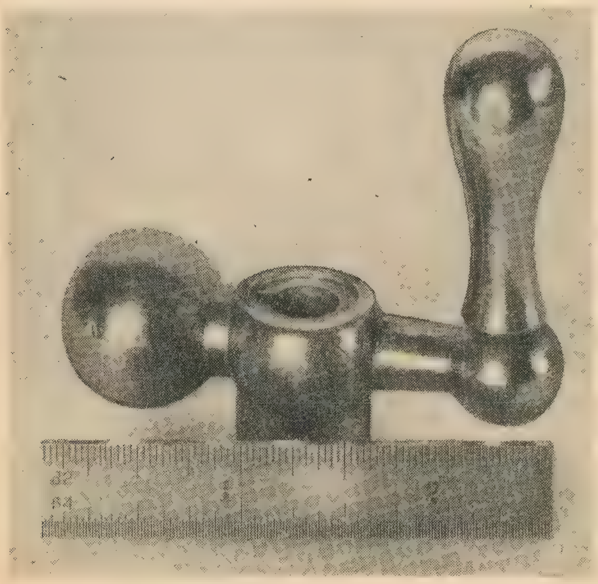


Fig. 2. The small handle originally fitted to the tool-slide feedscrew

The handle forming the finger grip can be made either with curved contours, as shown in the illustrations, or a straight taper can be adopted to facilitate machining. In the former case, the handle is best roughed out to shape with the lathe hand-tools and then smoothed with fine files, before being finally polished with emery cloth.

After the lever has been fitted in place on the feedscrew, the thrust-nut is adjusted, and the securing-nut is firmly tightened.

The new feed lever enabled the slide to be moved easily and quickly from one end of its travel to the other, thereby saving much time in setting the slide to the work.

Refitting the Gib-screws

On removing the gib adjusting-screws, it was found that they were of the dog-point type illustrated in Fig. 4, and their tips did not bear on the centre-line of the gib. This tipping action was, therefore, corrected by machining the points of the screws to an included angle of 60 deg.; after which, it was found that the slide could be more accurately adjusted and worked more smoothly.

The working of the slide was further enhanced by end-locating the gib strip in the way described in a previous article.

As already pointed out, the slide, under working conditions, may at

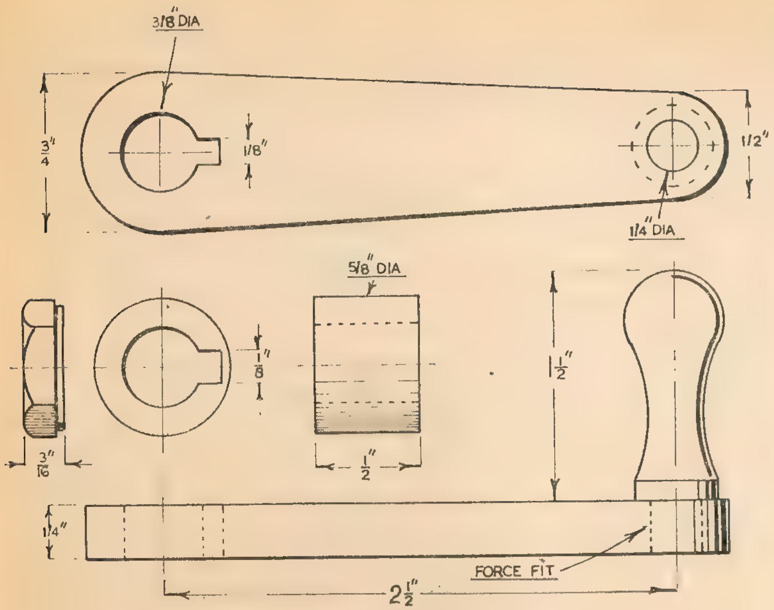


Fig. 3. The long feed lever

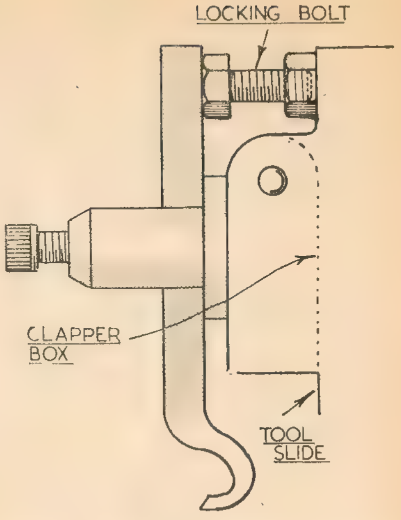


Fig. 6. Showing a method of fixing the clapper-box

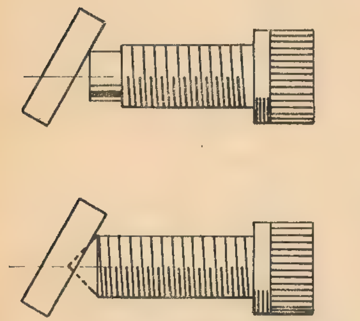


Fig. 4. Above, a dog-point gib-screw. Below, a coned screw bearing on the centre-line of the gib strip

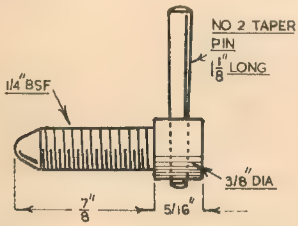


Fig. 5. The tool-slide locking-screws

times move downwards for a distance equal to the amount of backlash present in the feed mechanism.

Where heavy cuts are taken, the tool may be kept forced upwards; but it was found that, when taking a light finishing cut, the tool was liable to fall with the vibration set up and, as a result, the accuracy of the finished surface suffered and, at the same time, slight chatter marks or waves were liable to appear.

As we have always stressed the importance of locking all machine slides not actually in use when doing critical machining, the remedy was clearly to fit locking-screws to the tool-slide.

Two screws were, therefore, machined to the dimensions given in Fig. 5, and these should be given enough stand-out to clear the heads of the gib adjusting-screws. Before the finger levers are fitted, and before the screws are parted off, the rod should be screwed home against the gib and the position of each lever marked; that is to say, the screw should be just clear of the gib when the lever is pointing downwards. The heads of the screws are cross-drilled and then opened out with a taper reamer, so that the short taper-pins can be pressed into place by using the vice. Finally, the screws are parted off to length and their ends are faced.

When tightening the screws during a maching operation, care must be taken to see that they do not bear against an unsupported part of the gib strip, for this might well lead to bending the gib.

After fitting the locking-screws, it was found that the quality of the work machined was improved and even slight surface irregularities no longer appeared.

Locking the Clapper-box

When machining undercut, V-slideways, the tool will rise and tend to jam on the return stroke, unless the clapper-box is fixed and kept from turning on its hinge-joint.

An extemporised method of securing the clapper-box is shown in Fig. 6. This consists in inserting a bolt between the end of the tool shank and the tool-slide, so that when the nut is turned in the direction of unscrewing, the clapper-box becomes firmly locked. However, a more convenient way is to secure the clapper-box against its abutment face on the tool-slide by means of an Allen cap-screw, is shown in the photograph of the complete slide.

Next Week . . .

CHRISTMAS SHOPPING
A review of items selected from the lists of our advertisers, which can be recommended as suitable gifts for model engineers.

TIN-CAN TRACTION ENGINES
One of the most attractive items at this year's "M.E." Exhibition was the Chloride Batteries stand, with its tin-can traction engines. We publish a description of the latter and how they work.

FIRE-FIGHTING EXTRAORDINARY
"L.B.S.C." describes and illustrates a simple working steam fire-engine for the kiddies.

CHRISTMAS MAGIC
How to make some simple apparatus for producing a few amusing conjuring tricks at Christmas parties.

MUSIC HATH CHARMS
Our tame and profound Professor of Nonsense describes his efforts to make an electronic organ in next to no time.

"TALKING ABOUT STEEM . . ."
Jones Minor, in his own words and spelling, expresses his views on "steem," what it is, who invented it and what can be done with it.

NOVELTIES FOR CHRISTMAS
How the home workshop may be devoted for a brief space to the service of Santa Claus.

QUERIES AND REPLIES

"THE M.E." FREE ADVICE SERVICE. Queries from readers on matters connected with model engineering are replied to by post as promptly as possible. If considered of general interest the query and reply may also be published on this page. The following rules must, however, be complied with:

(1) Queries must be of a practical nature on subjects within the scope of this journal.

(2) Only queries which admit of a reasonably brief reply can be dealt with.

(3) Queries should not be sent under the same cover as any other communication.

(4) Queries involving the buying, selling, or valuation of models or equipment, or hypothetical queries such as examination questions, cannot be answered.

(5) A stamped addressed envelope must accompany each query.

(6) Envelopes must be marked "Query" and be addressed to THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

Carburettor for "Seagull" Engine

I am proposing to build a 10 c.c. "Seagull" petrol engine, and should be obliged if you would inform me where to obtain the castings. Would the "Kiwi" automatic carburettor, as referred to in the "M.E." plans list, be suitable for this engine?

R.Mc.C. (Chester-le-Street).

Castings for the construction of the "Seagull" 10 c.c. twin petrol engine can be obtained from Craftsmanship Models Ltd., 27, Circle Gardens, Merton Park, London, S.W.19.

The "Kiwi" automatic carburettor as advertised in our plans list would be too large for a 10 c.c. twin engine in its standard form, though it could be reduced in size. However, a special carburettor has been devised for this engine, and is illustrated on Sheet 1 of the drawings. Castings for this are included in the set as supplied by Craftsmanship Models.

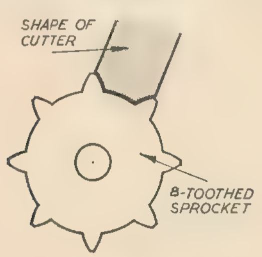
Film Sprockets

I would be greatly obliged if you could inform me how to cut a sprocket wheel for 35 mm. film, and what shape of cutter would be required. I have the requisite machine tools and dividing head.

In this type of sprocket, the teeth are widely separated, and it puzzles me how to form the teeth and the cylindrical portion between them in one operation.

A.L.P. (Leicester).

The teeth on these sprockets are approximately of involute form, and could be cut by using an involute cutter to form the flanks of the teeth, and



clearing out the space between them with a separate cutter. In practice, however, it is more usual to cut the teeth at one pass by using a form cutter shaped to cut the flanks, and also the base circle.

For small quantity production of these sprockets in brass or other readily machinable metal, a single-point fly-cutter could be used. It should be pointed out that the actual shape of the cutter will depend upon the number of teeth in the sprocket, as the curvature of the base circle will obviously vary under these circumstances.

Sprockets are sometimes built up by using a cylindrical centre portion with two toothed discs at the sides. It is also possible to make fairly satisfactory sprockets by drilling holes and inserting circular teeth externally shaped to the correct tooth form, but little time is saved by adopting this method.

Steel Wire

Can you please advise me where to obtain supplies of 26-s.w.g. bright or tinned steel wire, similar to that used for paper staples?

J.C.P. (Pontypool.)

We suggest that you try the following firms: Joseph Nichols & Son Ltd., Cheapside, Birmingham. George Baker Ltd., Cecil Street, Birmingham, 19. Tinsley Wire Industries Ltd., P.O. Box 119, Sheffield, 9.

Painting the Waterline on a Ship Model

Can you give me any advice on painting the waterline on my ship model? I have in mind cutting a $\frac{1}{16}$ in. wide strip from some pre-war adhesive strip, and sticking it on between the black and copper, and coating with clear varnish.

J.A.H. (Cheltenham).

The best way of painting a white line on your model is, first, to paint a broad strip of white along the waterline, then mark on this strip the upper limit of the white line you wish to leave; put a strip of gummed paper along the hull up to the level of this line and then paint the black hull down to the paper, making sure that the paper is touched all along. Next remove the gummed paper and mark a second line on the white strip which will represent the lower edge of the finished line. Stick a piece of gummed paper above the lower line but in contact with it all along, and then paint from below up to this paper. When the paper is washed off, the original white surface will be left in the form of a narrow clean strip.

This is much better than gumming on a separate strip, as in the course of time, this is almost sure to come off.

A DIVIDING ATTACHMENT FOR THE LATHE

(Continued from page 658)

Finally, finish-turn on a mandrel at slow speed. Fix to the carrier by three $\frac{1}{8}$-in. countersunk-head steel screws.

The spindle, its handle, spring plunger, and clamping-nut, can now be made; these are clearly shown in the drawings and need no further comment.

Finally, the sector rings and arms are required to complete the job; mild-steel is used for these, and they can be built up. It will be noted from the drawings that the arms are made from $\frac{3}{8}$ in. by $\frac{1}{4}$ in. bar, to save bending strip material. They are held in the 4-jaw chuck, and after turning the spigot No. 6 B.A. for screwing into rings, they are filed to shape as shown. After drilling and tapping the rings, a flat about $\frac{1}{8}$ in. wide is filed across the ring, so that the arms butt up close when screwed home. There is one point to note here; before removing the arm from the chuck, try on its ring and see that the underside of the ring and arm are both flat to a surface plate. When the arm is screwed tightly home, take very light cuts off the shoulder until the above condition is obtained.

The 40 to 1 steel worm and gunmetal worm-wheel were obtained ready made from C. C. Whitney & Co. Ltd., Leytonstone, London, and are obtainable from stock. The specification is:—

Worm—steel 40-1, single start, $\frac{5}{8}$ in. outside diameter and $\frac{1}{4}$ in. bore.

Wheel—gunmetal 40-1 single start, $2\frac{11}{16}$ in. diameter, and $\frac{5}{8}$ in. bore.

The worm wheel requires carefully setting in the lathe, being then bored out to $\frac{5}{8}$ in. diameter to fit lathe spindle end accurately, and fastened by means of an Allen screw.

The job should now be finished bright all over; "frosting" or "spotting" both look well, if carried out on well polished work, but, of course, will not improve work that is "highly polished and deeply scratched."

Oil and assemble as shown in the drawings, and I can assure any reader, if care is taken in its construction, he will have a real "tool-room" job.

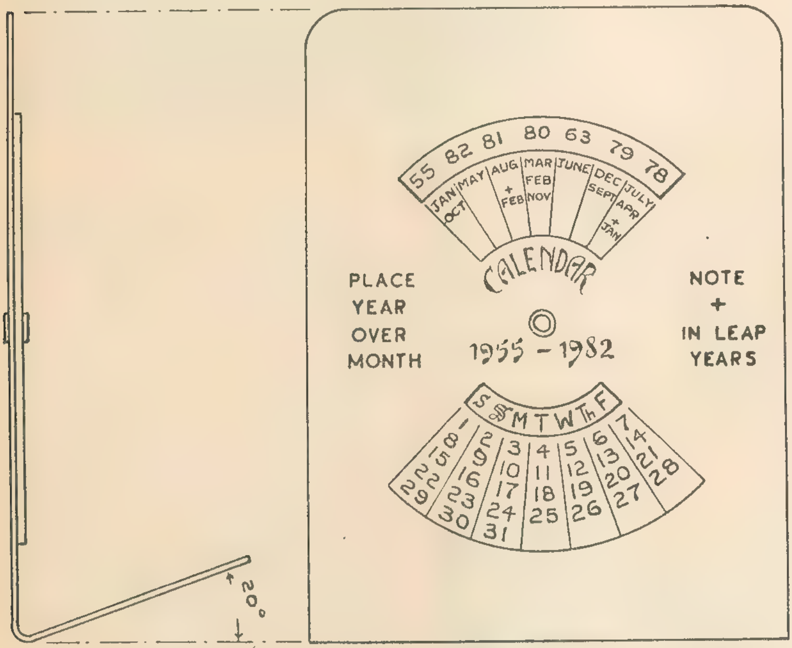
Twenty-six threads per inch have been detailed on the drawings, but any other fine thread will do just as well. Nuts of 26 threads, suitable for the above attachment, are readily obtainable at any good cycle shop, just the right thickness.

A table should now be compiled, showing required number of divisions, on which circle obtained, number of turns of the handle, etc., and hung up in the workshop.

A CALENDAR FOR TWENTY-EIGHT YEARS

By A. D. Stubbs

YOU know how it is, when someone asks on what day the thirtieth of June 1980 falls, or whether Christmas Day comes on a Monday next year? Well, that is what really started me off on the Twenty-eight Year Calendar, and if you would like some exercise in polishing and etching, then this is just the job.



Side and front views of the finished calendar

It consists of but two components, or three if you count the central eyelet, and since the latter determines the size of the drilled hole in the other two parts, it would be advisable to procure this first. I believe that these brass eyelets can be obtained from shops catering for the leather worker, but mine was acquired from the local cobbler. When I called in, plus a pair of shoes for repairing, I did not anticipate the variety of eyelets which proved to be available, but there they were, in sundry sizes, and either brown, black or colours. However, the brown ones had some kind of plastic cover, but the metal underneath was brass, so with but a very little persuasion, the plastic came off and yielded me a brass eyelet.

The main portion of the calendar is 16-gauge sheet brass, 4$\frac{1}{4}$ in. wide and 7$\frac{3}{4}$ in. long. As my sketch shows, it is bent at 20 deg., to produce a front portion 5$\frac{1}{2}$ in. long. The two top corners are radiused at $\frac{3}{8}$ in.

Two slots are cut in the front, the upper permitting seven years to appear, the lower showing the seven days of the week. Both, of course are set out from the eyelet centre, the inner and outer radius of the upper slot being 1$\frac{1}{2}$ in. and 1$\frac{13}{16}$ in. respectively. The lower slot dimensions are $\frac{3}{4}$ in. and 1 in. and both slots extend through an arc of ninety degrees.

Once these slots are cut, and the centre hole drilled to accept the eyelet as a snug fit, you can proceed with the polishing. No. OO emery cloth will go a long way towards obtaining a mirror finish, but if you have been unlucky enough to scratch the surface, you may have to start with a coarser cloth. Don't try to remove a mark by intensive rubbing on one spot alone; the only cure is to rub down the whole plate until the mark disappears. The inevitable metal polish, combined with a little pumice powder to commence with, follows the emery, but look out for gritty particles in the powder, and discard them at once.

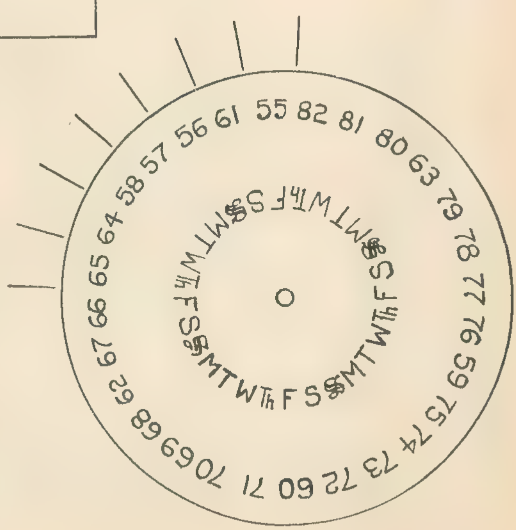
More Polishing

The revolving disc, which is fixed to the rear of the calendar, is 4 in. diameter, also cut from 16-gauge sheet brass, with a hole in its centre to match the eyelet. At this stage one benefits by the experience gained in polishing the front, as the procedure is repeated, although you may require another tin of elbow grease. Around the edge of this disc the year numbers are etched, the outer and inner edges of the figures being on 1$\frac{3}{4}$ in. and 1$\frac{9}{16}$ in. radius respectively. For the days of the week, strike circles at 25/32 in. and 31/32 in. radius, but do not mark out on the disc itself, or you will have another session of polishing on your hands. I set out on drawing paper the centre, all four circles, and the eight radial division lines, then cut out, with a razor blade, slots precisely similar to those on the calendar front. With the disc beeswaxed, and the paper superimposed, I could scratch the letters and figures through the protecting film, moving the paper ninety degrees for each successive quarter.

Twenty-Eight Divisions

As you may have already discovered, to divide the disc circumference into twenty-eight divisions produces an answer about as long as a piece of string, so you can save yourself a lot of trouble by copying the division lines from my sketch, this being the sole object of their incorporation in the drawing.

(*Continued on page* 667)



The revolving disc, etched ready for assembling

Making Model Tread-Plate

By N.H.

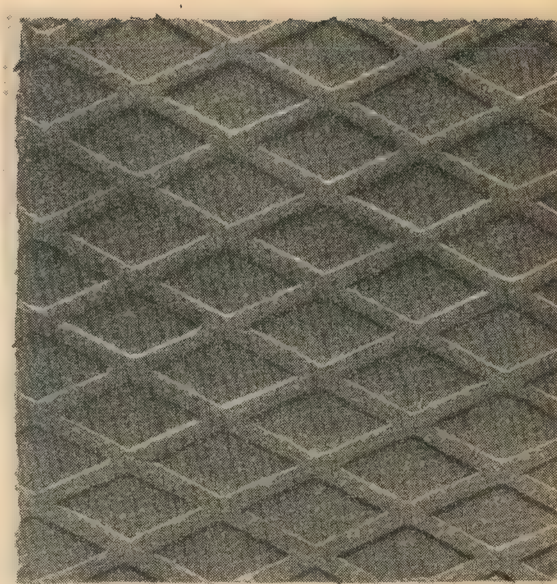


Fig. 1. A sample piece of commercial chequer-plate

TREAD-PLATE is used for the flooring of locomotive and other types of engine cabs and surrounds. This may consist of plain steel plate, plate with parallel ribbing or plate with raised ribs forming a diamond pattern. The latter variety is usually known as chequer-plate, and a sample of this material, used by a firm of marine engineers, is illustrated in Fig. 1; the diamond patterns here measure 2 in. in length and 1 in. in breadth.

When building the model road roller designed by Mr. E. T. Westbury, considerable thought was given to adopting a realistic type of tread-plate for the cab flooring. Although chequer-plate would probably have been the right material for this purpose, enquiries in many quarters failed to get a satisfactory answer to the question of how this could best be made on such a small scale.

It appeared that the chequered form of tread-plate had been made by soldering strips of ribbing to a plain plate, but this method seemed hardly practicable, in view of the immense amount of labour that would be entailed in cutting the ribbing exactly to shape, so as to form a series of joints that would bear close inspection. Any unevenness at the joints or solder encroaching on the bright steel parts would, it was felt, entirely spoil the appearance. In commercial practice, chequer-plate is sometimes made by rolling the steel plate with a hardened die, so as to raise a diamond pattern on a plain ground.

Casting the tread-plate is also sometimes resorted to, but neither of these methods seemed to promise satisfactory results when applied in the small workshop. Machining a steel die-plate and then casting the tread-plate in soft alloy would hardly produce anything realistic, even if the casting were afterwards plated to more nearly resemble steel. The use of a form-punch was also considered, but uniformity of spacing would be difficult to maintain and distortion of the material was also feared.

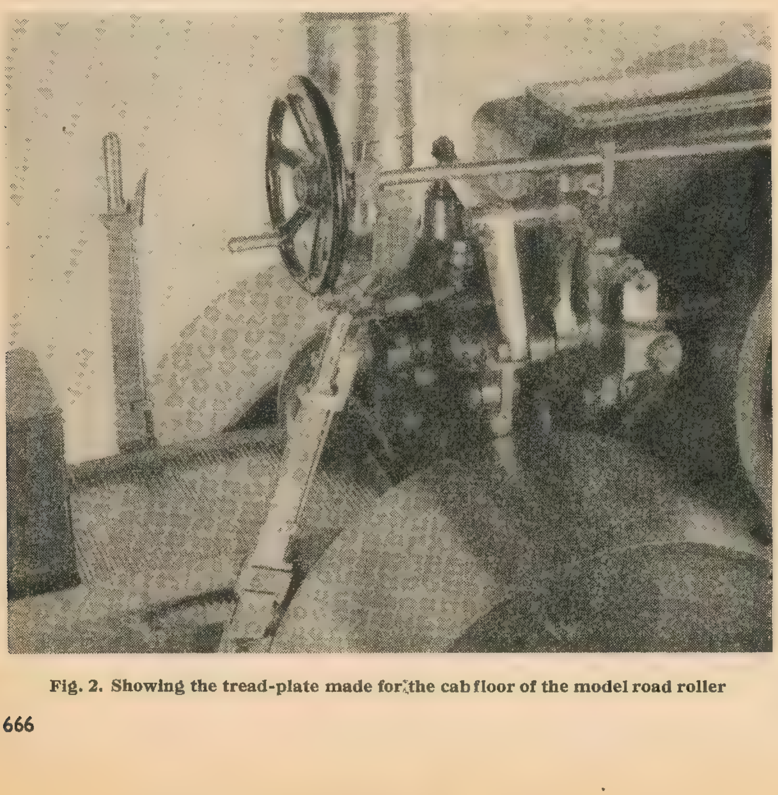


Fig. 2. Showing the tread-plate made for the cab floor of the model road roller

Eventually it was decided to use ribbed steel plate for the cab floor, as this could be machined without great difficulty, and the appearance would be sufficiently realistic. A photograph of the interior of the cab is reproduced in Fig. 2, and one of the finished slats is shown in Fig. 3. For this type of tread-plate it is, of course, essential to make the ribs the right height and with the correct spacing; moreover, the ribs must be exactly parallel or the appearance will be most unsightly.

Machining the plate with a form-tool mounted in the shaping machine seemed to be the easiest method, but it was essential to avoid making chatter marks that would have spoilt the flat background. However, the Drummond hand-shaper, then in use in the workshop, was a robustly constructed machine and could be relied on to produce a good finish, even with a broad-faced tool.

Rather than make a special tool for the job, it was decided to use an external hand-chaser ground to the required form, for the radius at the roots of the teeth would form the ribs with rounded tops, and the correct tooth pitch could be easily obtained.

After taking trial cuts on a piece of brass, it was found that a chaser of 16 t.p.i. produced ribbing of the right pitch.

The height of the chaser teeth was then reduced by grinding the end of the tool against the periphery of the wheel.

Trials were made from time to time on a piece of brass, and the grinding was continued until the ribbing formed

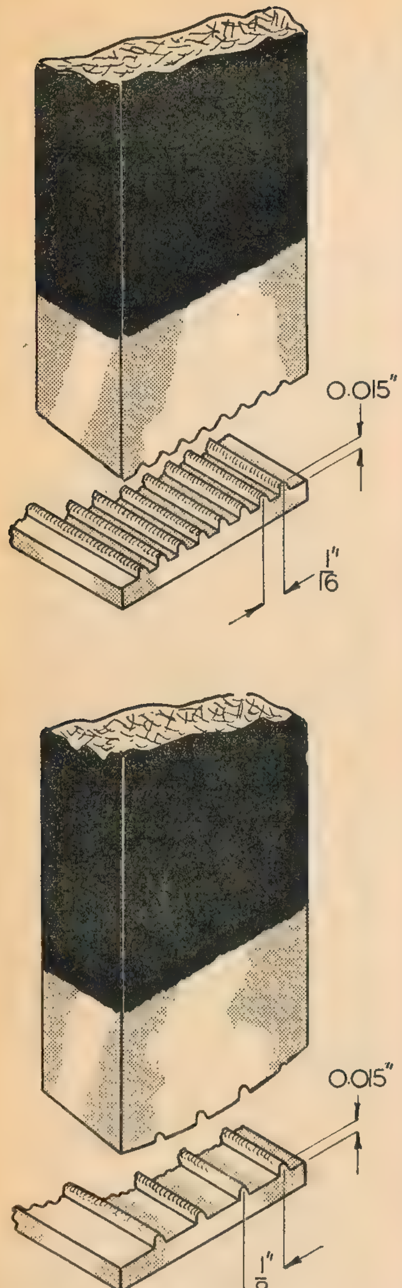


Fig. 4. Showing the form of tread-plate cut with chasers of different thread pitches

was rather less than half-round in shape. Next, one of the lengths of steel strip was gripped in the shaping-machine vice and a levelling cut was taken over the surface. After mounting the form tool in the machine, the carriage was traversed to bring the centre of the first notch in the tool to exactly 1/32 in. from the edge of the plate. The purpose of this was to machine all the lengths of tread-plate so that they would fit together and maintain equal spacing of the ribs.

After the first rib had been cut to the finished depth, the carriage was traversed to bring the second tooth notch exactly into line with the first rib. In the same way, as each rib is finished, the tool is moved on for $\frac{1}{16}$ in. to bring the next tooth notch and flat into cut. In theory the chaser need have no more than two tooth notches, separated and flanked by ground flats; but if the shaping machine is up to its work, a broader cutting face can be used, and the finish of the work will be improved by the light, scraping cuts taken by the teeth that follow. Any of the machine slides not in use are best firmly locked, in order to increase rigidity; in addition, the application of cutting oil will promote free-cutting and a smooth finish on the work. The material actually used for making the tread-plate was mild-steel of 1 in. width and $\frac{1}{16}$ in. thickness. The slats were machined in lengths slightly greater than the width of the cab in order to allow for fitting, and when these were in place the joints were not noticeable, as equal pitching of the ribbing was maintained throughout.

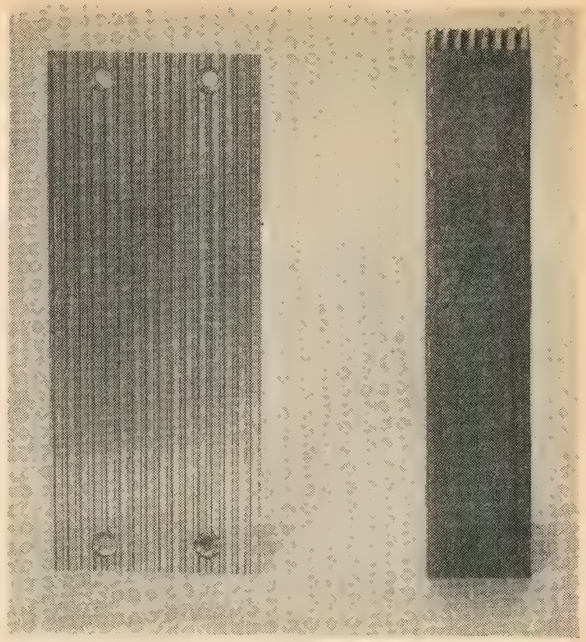


Fig. 3. One of the flooring slats, and the form-tool used for cutting the ribbing

To secure the plates to the side members of the cab, each was drilled to take four countersunk-head 12-B.A. screws.

This road roller has been lent to several exhibitions, but so far no one has, to our knowledge, taken exception to the form of tread-plate fitted, not has anyone suggested an alternative type of cab flooring; nevertheless, some reader will, perhaps, now do so in the interests of realistic modelling.

A CALENDAR FOR TWENTY-EIGHT YEARS

(*Continued from page* 665)

With the disc ready for etching, we are left with the calendar front to finish. The same indicator lines will divide the month and figure tables, and here the lines can be scratched through the beeswax, for etching. The figures should be $\frac{1}{8}$ in. high, but to get four letters in the available space, as in "Sept" you will have to keep them to $\frac{1}{16}$ in.

Finish

Ornamentation of the calendar face can, of course, be carried out, but personally I prefer the plain polished brass, either lacquered or left in the bare state, although the latter entails repeated polishing.

And there it is. As long as you can remember the current year and month, you can set your calendar or, alternatively, by revolving the disc, the day of any date up to December 31st, 1982 can be seen at a glance. Unfortunately one cannot mark holidays or other special events, because the same set of figures has to be utilised for every month.

The etching? Use nitric acid, diluted, and when it has done its job, neutralise it with an alkali—chalk will do—before removing the beeswax, for which purpose gentle heating is ideal.

READERS' LETTERS

Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.

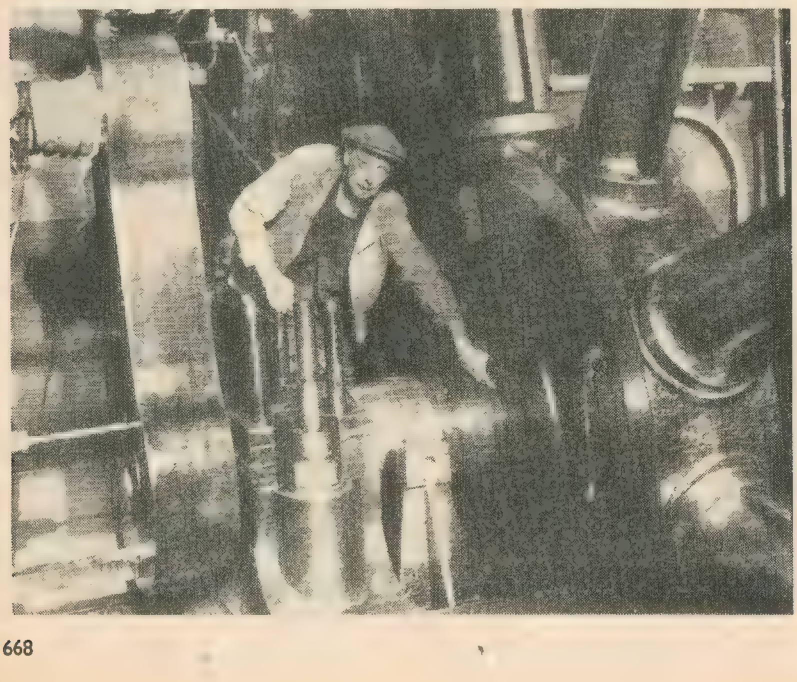
A BROKEN BEAM ENGINE SHAFT

DEAR SIR,—I am enclosing a photograph of a breakdown on a beam engine, the flywheel shaft of which broke where the engineman is pointing, the shaft here being 16-in. dia., and the swell in the wheel being 18½-in. dia. The wheel is a spare wheel with machine-cut steel segments on the outside, 22 ft., 6 in. dia., driving two pinions, one on each side of the wheel. There are 10 arms in the wheel, which is staked on the shaft with 6 keys. This shaft has run 82 years, and the flywheel 57 years. The engine is a 4-cylinder triple-expansion, working at 160 lb. pressure, the h.p. having Corliss gear and the I.M.P., and the two L.P., piston valves.

The engine is 98 years old, but there is not much left of the original, which was built in 1856 by J. & D. Yates of Blackburn. It runs at 34 r.p.m. and the dimensions are: H.P. 7 ft. stroke, 30-in. bore; I.M.P. 3 ft. 6 in. stroke, 48 in. bore; L.P. 7 ft. stroke, 40-in. bore. I.H.P. 1,000 (at one time it produced 1,400 I.H.P.).

This engine is installed at Victoria Mills, Earby, Nr. Colne, Lancashire. My firm, Hy. Brown Sons & Pickles Ltd. of Barnoldswick are doing the repairs. The photograph is by Mr. C. Rawlinson of Burnley.

Yours faithfully,
Barnoldswick. JOHN PICKLES.



OUR INLAND SEA

DEAR SIR,—I read, with great interest, your recent article on the marine tank at the "M.E." Exhibition. *Geebaa III* was such an excellent example of modern engineering craftsmanship and put over such a superb demonstration of radio-control as to make a visit to the hall worthwhile on her account alone. The excellent layout of components in the hull and the beautiful design of the control unit deserve great credit. We do not all admire the class of yacht which was chosen as a prototype, however, but it has the most suitable hull for the application of R/C with electric or internal combustion propulsion. Mr. Clayton was able to give the most impressive demonstrations of independent control of twin screws. The system used showed the most affective use of single channel radio.

It has been said by some people, including Mr. Clayton himself, that the model is not suitable for the usual radio control contests where steering round a set course is the main object. I would suggest that the main reason for this is the steering control by push-button selection. As mentioned in my article published in *Model Ships and Power Boats* last year, it is a great advantage to have "realistic" control of both rudder and speed. I, therefore, submit that it would be a great advantage to be able to operate the rudder by a wheel or pointer, and the engine movements by a lever for each screw. One could thus manoeuvre instinctively without having to look down at the control-box and search for the correct button. Mr. Cummins with his *Conrad* proved this point by his demonstrations during the first Saturday. *Corlicker* also proves this theory.

Mention was made of Mr. Waller's detailed model paddler *Royal Eagle*, which was also seen during the first Saturday several times. Readers should not make the mistake, however, of thinking that the paddler seen on the S.R.C.M.S. stand between demonstrations was that ship. On the stand, almost throughout the exhibition was her sister ship *Crested Eagle*, a very much smaller and less accurate model of another vessel owned by the same company. The latter model was kindly loaned by the "motoring editor" mentioned in your article. He is an enthusiast on paddle steamers, having no less than three remote-controlled models of this type. This one is the smallest, with *Crested Eagle* I gave many demonstrations of elementary radio-control using a clockwork escapement to govern steering and engine movements.

Finally, I would close by remarking that it was a great pleasure to discuss radio-control with the many keen engineers at the exhibition. Furthermore, I must admit that *Corlicker* was not quite as reliable as your reporter suggested, she had several nervous upsets!

Yours faithfully,
London, W.2. T. C. CARRINGTON WOOD.

WHERE THEY GO

DEAR SIR,—Your query "What is Their Story?" in "Smoke Rings" in your issue of October 7th last is one that I have always been interested in. While many models come to an end as indicated by you, there are quite a number that do not. In many large cities and towns, especially in the north of England, can be found, mostly in back streets, a class of shops generally known as junk shops. Some deal in anything, seemingly, from old boots to oil paintings, whilst others keep to what one may call mechanical muck. These latter I never pass by, and many a bargain have I had from them. Among the varied stock could often be seen a number of model steam engines, some with boilers and some without, and ranging from mere toys to others capable of doing useful work.

Horizontals, verticals, diagonals, oscillators, etc., were all there, and, more rarely, a compound. Workmanship varied from the rough-and-ready to the very finest, but all were free-lance jobs, and had no museum value.

In one large city in the north, world-renowned for its shipbuilding and engineering, I knew of two or three such homes for unwanted models. It has a very fine technical museum, and, on two occasions, I had the pleasure of being shown round it by the curator. We also went " back stage," and in a store-room I saw a number of models such as I have mentioned above. When I asked how they came there, I was told that in many cases a model maker's collection had been donated to the museum, but perhaps only one or two models were of historic value or of museum interest.

In most of these small collections of models that I have seen, there was a notable absence of locomotives, traction engines, and boilers. I will refer to boilers shortly. From a careful inspection, I should say that the story of many of these models is that they were made in local works " on the nod." In the days when most of them were made, an apprentice was often encouraged to make his own tools, such as squares, calipers, scribing-blocks, etc., and having made such things would start on a model steamer. If on a lathe, he could manage the turning and a little carefully distributed " beer money " (calculated in those days in " pints " and " pots ") would produce castings and forgings, etc. Many a foreman has turned a blind eye on such jobs, knowing well that an apprentice with enough energy to do such work, when he need not, would make a good and interested workman later on.

But the boiler ! Well, the engine parts were easy to hide, but a 30 in. × 12 in. boiler would make such a bulge under the overcoat that the most purblind gatekeeper would have to spot it.

As to engine parts, I speak from experience, and am not alone.

As to early shop-made tools, a few weeks ago I went over a large engineering works. On a very modern lathe a turner was truing up a forging with one of the old-time scribing-blocks. Old-timers will know the sort ; massive circular base, heavy stem and wing-nuts that even the ham-handed could not break. I picked it up, and the man showed me the maker's name stamped underside the base, and the date of 1879. He said: " Aye, me father made that, an' it's better than all the fancy ones for my job." Of course, there are a few collectors of these early models, like the late Mr. H. O. Clark and his son, both of the Norwich S.M.E., and one year a large number were shown working under air.

Yours faithfully,

Luton. ERNEST W. FRASER.

A NEW USE FOR MICROMETERS

DEAR SIR,—Experiencing difficulty in obtaining a fine enough adjustment of a wristlet watch, I put a 0-1 in. micrometer to good use. Placing the anvil of the micrometer squarely behind the winding button, the micrometer was brought into line with the regulating lever, the spindle being rotated until it was just touching the latter. From this point a fine adjustment was made of about 0.002 in.

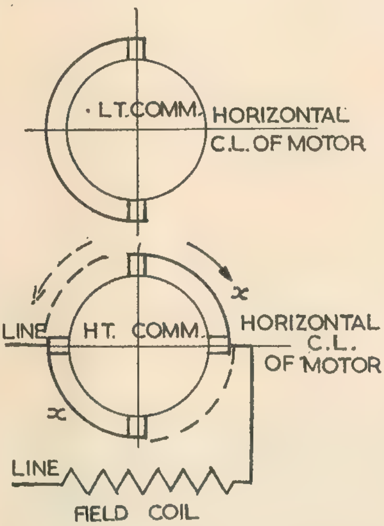
Only one other adjustment was necessary to bring the watch to satisfactory time-keeping. Perhaps the foregoing will be of use to those interested in watches and their adjustment.

Yours faithfully,

Glasgow. R. JOHNSTON.

ELECTRIC MOTOR CONVERSION

DEAR SIR,—In your issue for October 7th there is an article by L. Frater on " Modifications to Ex-Government Motor Generators." Having tried the usual connections advised, and finding that their disadvantages left much to be desired, I eventually tried the connection shown in the diagram, and the result was good.



For reversing, I change the leads x to the position shown dotted in the diagram.

Moving the end brackets around, in the slots, also affects the torque and speed to some extent.

I should be interested to know what Mr. Frater thinks of this idea.

Yours faithfully,

Gateshead-on-Tyne. W. WILKINSON.

CONSTRUCTING MACHINE SLIDES

DEAR SIR,—Years ago, with some workshop facilities available, I made up a 5 in. centre wood-turning lathe to use for toy-making. This was built on a bed composed of two 2 ft. 3 in. long, ½ in. square cast-iron crosshead guides from an old portable steam engine.

This lathe had many faults and limitations, and I soon felt the need of a slide-rest to extend the range of my capabilities.

The cross-slide for this was practically completed in bright mild-steel sections, against my better judgment, when I got an " M.E." back-number of last year, carrying a description of a milling machine using slides of the same material. I have now collected quite a few " M.E." back-numbers, and find that several of your contributors have used this material for slides in various machines.

My cross-slide has not yet seen much work, and I have been very careful to keep it flooded in S.A.E.20 motor oil, whilst using it, packed up on a block of hardwood, to face first a faceplate and then, for use as a saddle, an 8 in. length of 5 in. × ½ in. B.M.S. set-screwed to the faceplate from behind. This 5 in. × ½ in. was not so " bright," as it was warped about 17-thou., and I was agreeably surprised to get it truly straightened to lie flat on the surface plate at first attempt.

If this slide does give trouble, I intend to have one part of it cadmium plated to prevent scoring.

When one has to face up slides by hand, it seems that building them up is generally considered to be the easiest way, but it might be just as easy to use built-up construction in cast-iron as it is in bright mild-steel flats, which are not very accurate anyway, and are apt to spring about when cut into strips. I formed the slide and guide strips from one piece of steel, hack-sawn down each side with an angled block of wood clamped to the steel as a guide. There must be much hack-sawing practised by the " M.E." fraternity. It's hot work but doesn't take long compared with the tedious job of trueing up afterwards with files.

The real fun in all this is not in trying to compete with the many commercially manufactured machine tools, but in doing the best one can with one's own limited resources.

Yours faithfully,

Victoria, Australia. C. FERGUSON.

DOOR CHIMES

DEAR SIR,—With reference to the query on the subject of door chimes, by F.E.G.H. (Exmouth), I think your correspondent will find that the open circuit voltage of his transformer is too low, a voltage of not less than 16 should be allowed for with a motor of this class; this increased voltage is necessary due to the fact of the windings impedance, and the machine not being designed in the first place for a.c. operation.

Trusting this information may be of use to your correspondent.

Yours faithfully,

Enfield. J. W. COOPER.

WITH THE CLUBS

The Society of Model and Experimental Engineers

The next meeting of the society will be on Saturday, December 4th, at 2.30 p.m., at H.Q., 28, Wanless Road, S.E.24. Mr. D. G. Webster will give a talk and demonstration based on the G.W.R. Dean Single. Visitors will be welcome.

Full particulars of the society may be obtained from the secretary: S. L. SHEPPARD, 3rd Floor, 11, Portland Place, London, W.1.

Romford Model Engineering Club

The following meetings will be held during the next two months:—

December 16th—Annual Jumble Sale.

January 6th—Judging of entries for the "Watson" Prize.

January 20th—Annual General Meeting, when it is hoped all members will make a special effort to attend.

Meetings are held at the Lambourne Hall (Red Triangle Club), Western Road, Romford, Essex, commencing at 8.0 p.m.

Hon. Secretary: W. S. RUTTER, 154, Glenwood Gardens, Ilford.

Staines S.M.E. and C.

The society has now begun the winter session, meetings being held at the Phoenix Hotel Hall, commencing 7.45 p.m. The following programme has been arranged:—

December 15th—Demonstration of silver-soldering, etc., by a representative of Johnson, Matthey & Co. Ltd.

December 29th—Live Steam Night. *Not locomotives.*

January 12th, 1955—Demonstration of workshop practice, including filing, and cutter-tool grinding.

January 26th—Power Units for Model Boats. Talk by member Mr. H. Eastaugh.

Any model engineer living in the area will be more than welcome at any of these meetings.

Hon. Secretary: R. F. SLADE, 166, Kingston Road, Staines, Middx.

The Junior Institution of Engineers

Friday, December 3rd, at 7.0 p.m. Pepys House, 14, Rochester Row, S.W.1. Film Evening "The Manufacture of Portland Cement."

North-Western Section. Monday, December 6th, at 7.30 p.m. in the Fairbairn Room at the Engineers' Club, Albert Square, Manchester. Ordinary meeting: Paper—"Design and Construction of Horizontal Boring Machines," by W. Tomkinson (H. W. Kearns & Co. Ltd.).

Friday, December 10th, at 7.30 p.m. Pepys House, 14, Rochester Row, S.W.1. Inaugural meeting: Presidential address, "Engineering in the Twentieth Century," by Prof. S. J. Davies, D.Sc., Ph.D.

Sheffield and District Section. Monday, December 13th, at 7.30 p.m., at Livesey Clegg House, (opposite Union Street Cinema), Sheffield. Ordinary Meeting: Paper—"Post-war Developments in Coal Face Machinery," by S. McCallum, A.M.I.Mech.E. (Mayor and Coulson Ltd.).

Friday, December 17th, at 7.0 p.m. Pepys House, 14, Rochester Row, S.W.1. Informal meeting: Question and Discussion Evening.

Friday, December 31st, at 7.0 p.m. Pepys House, 14, Rochester Row, S.W.1. Popular Film Evening: "The Manufacture of Portland Cement."

Midland Section: Wednesday, January 5th, at 7.0 p.m., at the James Watt Memorial Institute, Gt. Charles Street, Birmingham. Ordinary meeting: Paper—"Power Press Safety," by J. Price (member).

Glasgow Society of Model Engineers

At the A.G.M. on October 30th, the following office bearers were appointed: President, Mr. Jas. McKechnie, vice-president, Mr. Alan Rodger. Messrs. Wallace, Suttie and Sutherland continue as before. The council now comprises the above plus Messrs. Rothwell, Kerr, Macartney Todd, W. Young and Keay. Mr. Peter Ribbeck was voted a Life Member of the society.

Hon. Secretary: R. SUTHERLAND, 66, Wellmeadow Road, Glasgow, S.3.

Bolton and District Society of Model Engineers

The above society held its annual competition for the award of the "Hays" Memorial Trophy (open to members only), on October 25th.

Some very interesting examples of good class workmanship were on view, which ranged from locomotives to sound recording apparatus. The trophy was awarded to the chairman, Mr. W. Dawson, for his timing device for model car racing.

At the annual general meeting, Mr. T. P. Longworth was unanimously re-elected president for the forthcoming year, and all officers agreed to continue in their respective capacities.

Meetings are held on the last Monday of each calendar month in the Co-operative Rooms, Bridge Street, Bolton, at 8.0 p.m. when anyone interested will be welcome.

Hon. Secretary: M. C. B. ARTHUR, 5, Limefield Road, Smithills Dean, Bolton.

Tees-side S.M.E.E.

On Wednesday evening, November 3rd, at Middlesbrough, members listened to a talk on "Small Scale Brazing, Soft and Silver-Soldering," given by Mr. R. W. King, A.C.G.I., a speaker who had already earned their respect by his talk on a previous occasion. Mr. King explained the reasons for the various precautions necessary to secure strong and reliable joints with various solders and fluxes, and demonstrated joints using silver-solder.

Hon. Secretary: J. W. CARTER, 28, East Avenue, Billingham, Co. Durham.

South London M.E.S.

The next meeting of the society will be held on Sunday, December 5th, at White Horse Hotel, 94, Brixton Hill, S.W.2, at 11.0 a.m.

The meeting on November 7th, subject "Simple Workshop Tools," having proved so interesting, it was decided that "Simple Tools and Gadgets" should be the subject for December 5th.

A special effort should be made by all members to attend, as an instructive and interesting meeting is promised.

During the 1954 season the locomotive section has been extremely busy with public track runs, and there are several items of track maintenance and minor repairs now due. Members willing to help are asked to contact the Hon. Secretary: W. R. COOK, 103, Engleheart Road, Catford S.E.6.

Harrow & Wembley S.M.E.

Our society will be holding the annual dinner and cup presentation this year on Thursday, December 2nd, at the Headstone Hotel, North Harrow. Reception will be at 7.30 for 8 o'clock dinner.

On December 8th at 7.30 p.m., Mr. Joyce, a marine engineer of long experience, will give a talk, at our headquarters, Heathfield School, College Road, Harrow (opposite Harrow-on-the-Hill Station). Visitors are invited to attend.

Hon. Secretary: K. D. CARTER, "Hedgeley," South Approach, Moor Park, Northwood, Middlesex.

North London S.M.E.

At the November general meeting of the society the "Brains Trust," Messrs. Hanagan, Weaver, Windart and Cashmore, were under fire with various questions from members; some of these questions were real teasers, but the Brains Trust emerged unscathed.

At the December 3rd general meeting, the subject will be "Locomotive Valve Gears," by Mr. E. Moon.

General meetings are held by courtesy of the Eastern Gas Board at their offices in Station Road, New Barnet, at 8.0 p.m.

Hon. Secretary: W. W. RANSOM, 6, Arundel Court, 127, Woodhouse Road, N.12.

Pauline, the 11-year old daughter of Walter Ashworth, president of the Bradford Model Engineering Society, driving her father's "Olympiade" (a 4-6-0 "Royal Scot" model) at the B.M.E.S.'s track at Thackley. The model, which is 6 years old, took 4 years to build

CORRESPONDENCE

The Managing Editor invites correspondence and original contributions on all small power engineering and electrical subjects. Correspondence and manuscripts should not be addressed to individuals, but to the Managing Editor, THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

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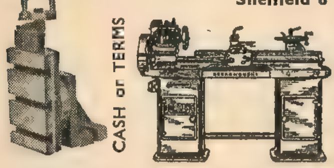

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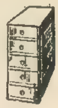

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